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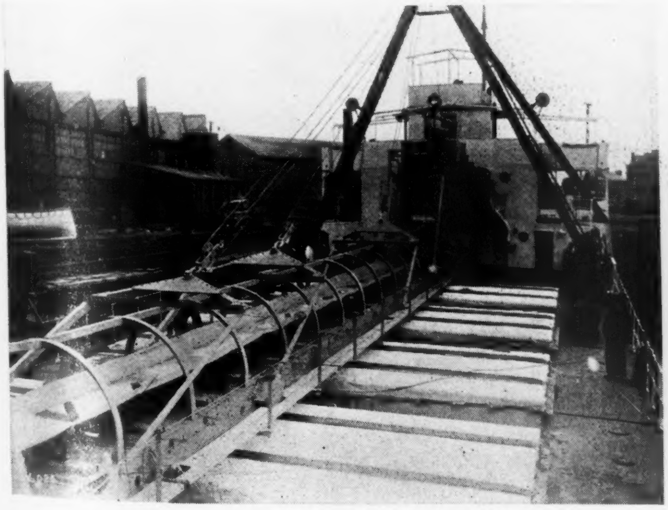
"Bulkarier" unloading cement at Quebec City storage silos, showing boom covered with canvas hood to reduce dust

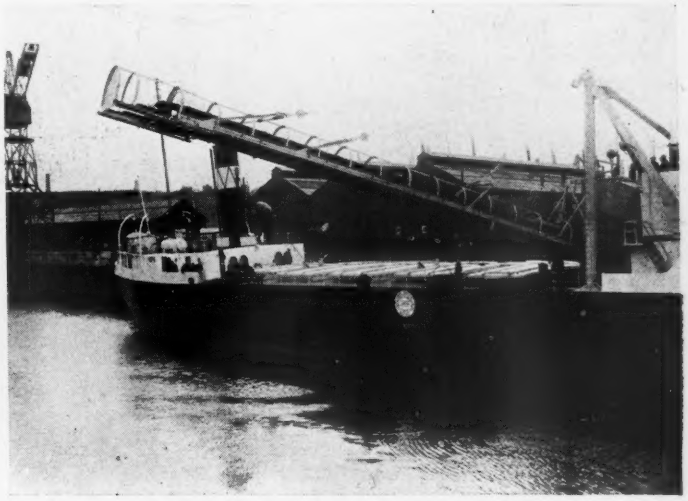
Ships for Handling of Bulk Cement Used by Canada Cement Co., Ltd.

Two Specially Designed Cargo Boats Serve a Series of Strategically Located Mills and Packing Plants

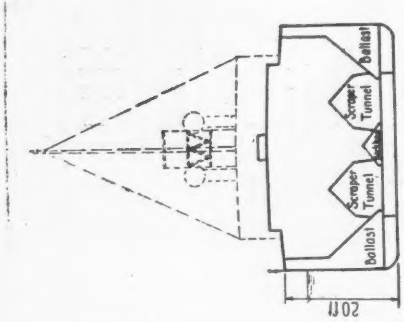
THERE ARE NOW numerous examples of the changes taking place and in prospect in the portland cement industry because of recent developments in bulk cargo handling and the utilization of waterways for cheap transportation. Thus, strategically located manufacturing mills and local packing and distributing plants are, apparently, obviating the need for more local mills, which for a time seemed to be the most significant development of the industry.

The Canada Cement Co., Ltd., has eight plants strategically located throughout Canada. It has made and is making major alterations and changes in its plants to produce a better and cheaper cement; the Winnipeg plant was changed in 1927-1928 from the dry to the wet process; the Hull, Que., plant was changed similarly during 1928-1929, and the Montreal, Que., plant has just been remodeled and changed from dry to wet process. Contracts were let not long since for the modernizing of the Port Colborne, Ont., plant. It will be changed





Deck views of "Bulkarier," showing boom conveyor

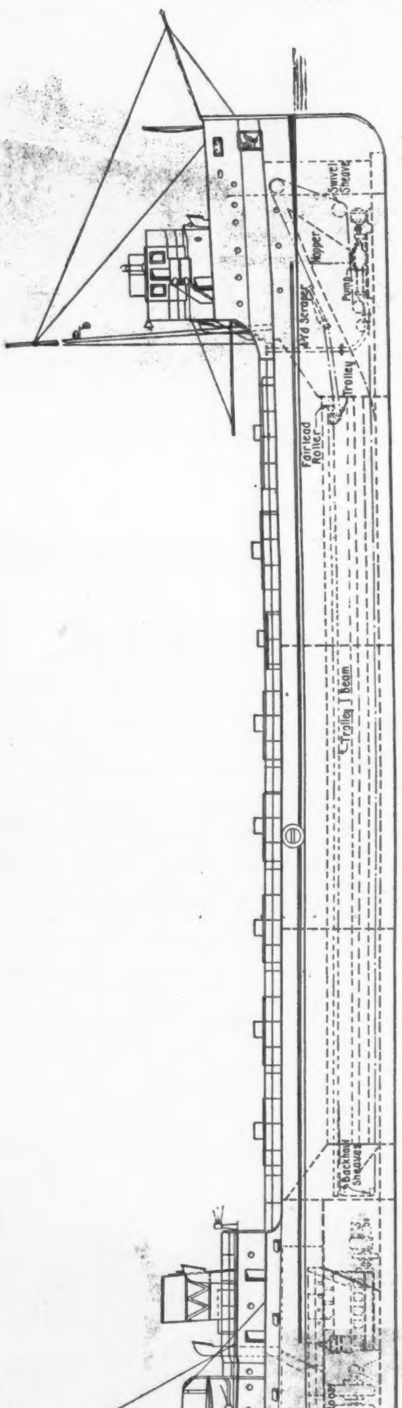


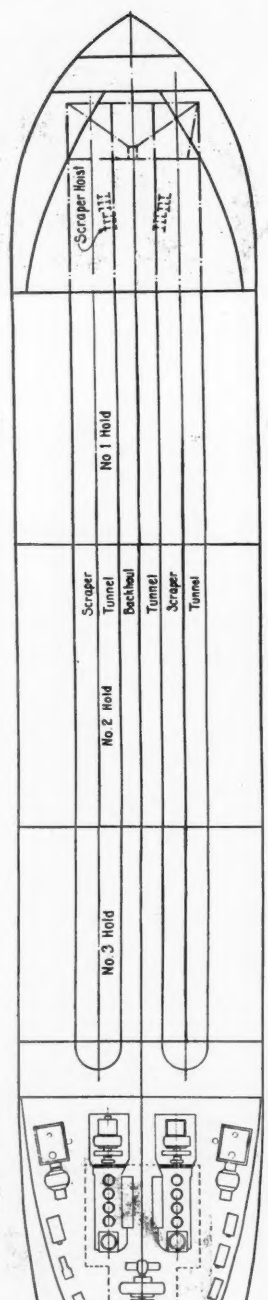
from dry to wet process, like the others.

It is not surprising that we find bulk transportation of portland cement by water to be one of the principal methods used by the Canada Cement Co., Ltd., for those plants located along navigable waters; and that the boats used for such haulage are, as a Great Lakes skipper put it, "The best bottoms on the Great Lakes."

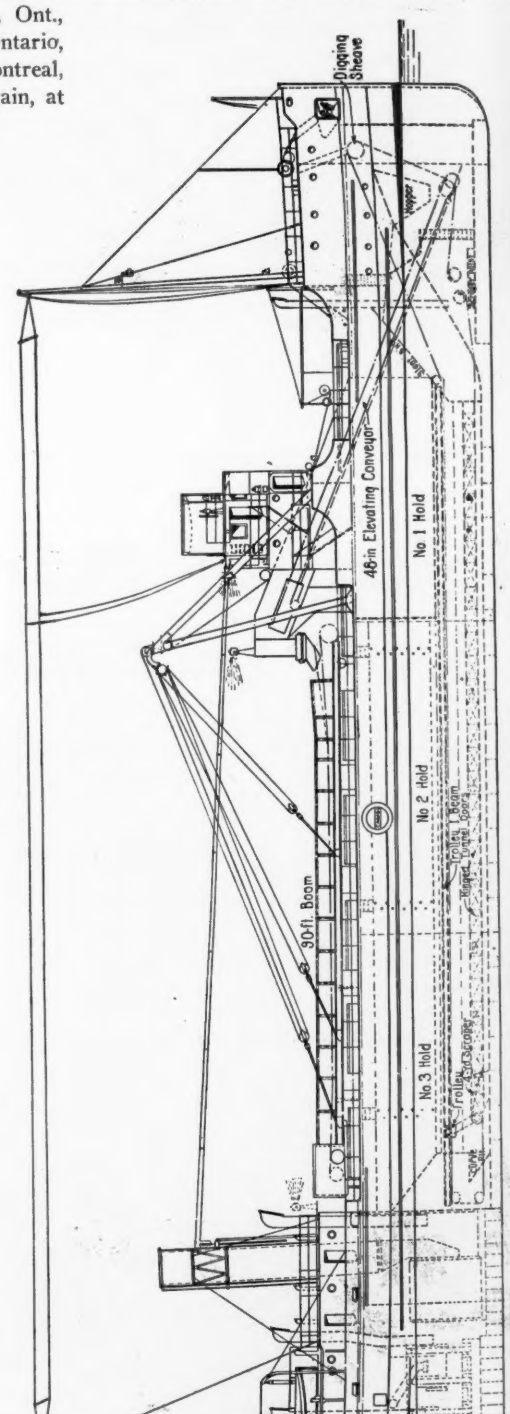
A glance at the map of northeastern Canada shows that the plants located at Belleville, Ont., and Port Colbourne, Ont., are both on the north shore of Lake Ontario, and the largest plant located at Montreal, Que., on the St. Lawrence river. Again, at Windsor, Ont., Toronto, Ont., Quebec City, Que., St. John, New Brunswick, and at Halifax, Nova Scotia, we find that the Canada Cement Co., Ltd., has erected silos and sacking plants for the storage and handling of the products hauled by these boats. Thus a territory that is in area an empire in itself, is economically served by cheap water transportation from a very few plants.

Two bulk-cement-carrying boats, the *Cementkarrier* and the *Bulkarier,* both

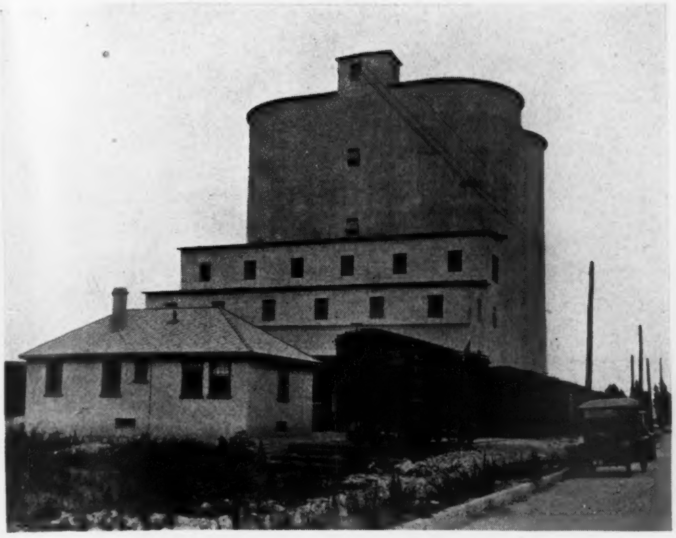




Motorship "Cementkarrier," Diesel electric self-propelled, for cement service only



Design of "Bulkarier" for handling cement and gypsum



Toronto packing plant of Canada Cement Co., Ltd.

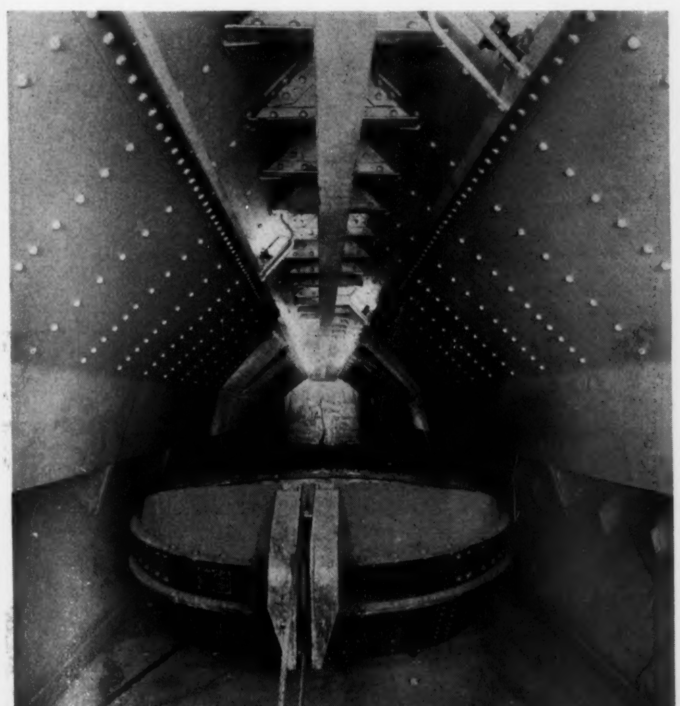
equipped with self-unloading equipment, are used in this service.

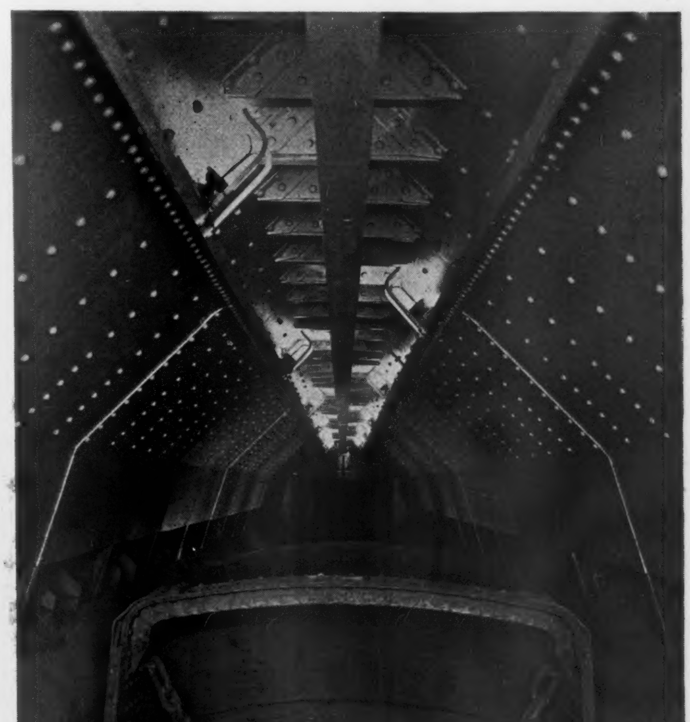
The *Cementkarrier,* handling bulk cement only, travels the waters of Lake Ontario and Lake Erie delivering cement from the Belleville or the Port Colbourne plants at Windsor and Toronto, while the *Bulkarier,* designed to handle crushed crude gypsum as well as cement, carries bulk cement from the Montreal plant to the packing plants at Quebec, St. Johns, and Halifax, returning with a cargo of crude gypsum from the properties of the Atlantic Gypsum Products Corp., at Cheticamp, Nova Scotia. For discharging the cargo, the patented tunnel scraper system devised by the Leatham D. Smith Dock Co., Chicago, Ill., is used in both boats, in connection with a Fuller-Kinyon cement pump on the *Cementkarrier* and belt conveyors on the *Bulkarier.*

Cementkarrier

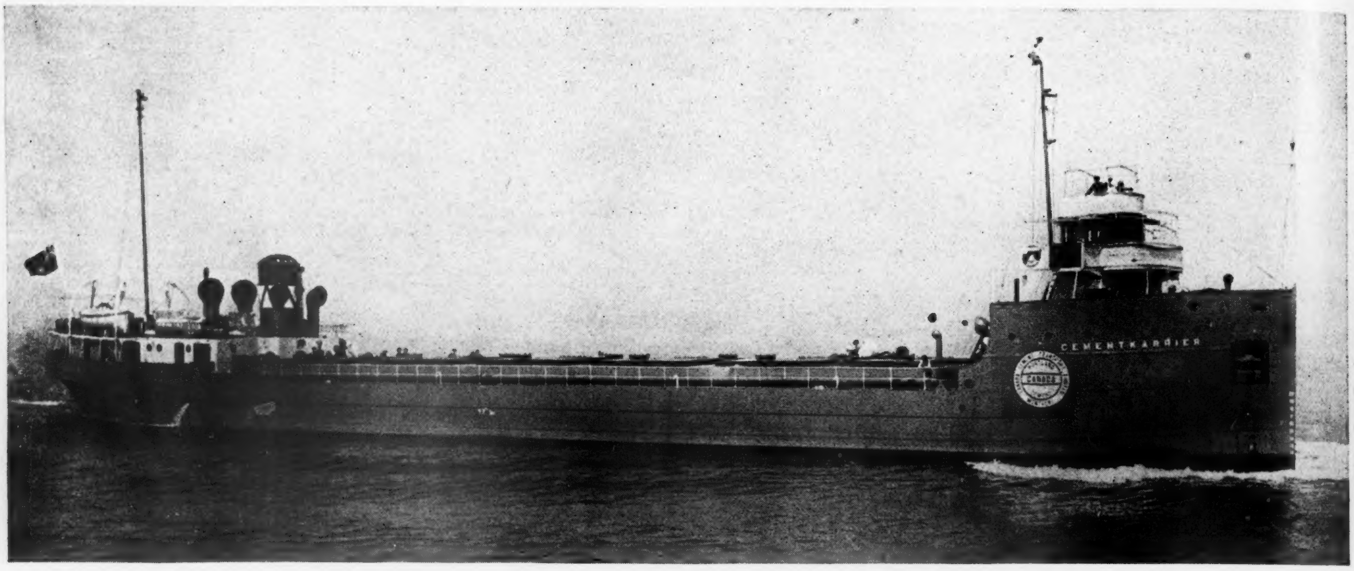
The *Cementkarrier,* which was put into service in August, 1930, and is the latest and undoubtedly the best and most modern bulk cement carrier yet constructed, was built by the Furness Shipbuilding Co., Ltd., of England, for the Canada Cement Transport Co., a subsidiary of the Canada Cement Co. It is entirely electric driven from Diesel-engine units, with a very complete control system which will be described more in detail further on. The principal dimensions and data covering the boat are as follows:

Length	258 ft.
Beam	43 ft.
Depth, molded	20 ft.
Deadweight	3150 tons





Scraper tunnel, showing scraper for delivery of cement from silos to boats. To the left is a view looking toward ramp leading to hopper on "Cementkarrier," while the other view is looking in the opposite direction



Self-unloading "Cementkarrier," owned by Canada Cement Co., Ltd.

Capacity	12,000 bbl. of cement
Speed	9½ knots per hour
Loading time	5 hours
Unloading time	10 hours
Main engines (2)	500 hp.
Propulsion motor	775 hp.

The cargo hold is separated from the main hold by a cellular double bottom and side construction so that any water leakage is easily kept out of the cement cargo, and the cargo space is divided by a longitudinal center partition and cross partitions into three hoppers on each side to prevent shifting of cargo. Water ballast is carried in the fore and aft peaks, and in the double bottom compartments under the machinery, while fuel oil is carried in side tanks and in part of the double bottom compartments below the machinery space aft.

The cement cargo is loaded into the hold through pipes from belt conveyors in overhead bridges.

The system used in unloading the cargo consists of two parallel, longitudinal tunnels extending under the entire length of the cargo hold and arranged with doors to allow the material to flow into the lower part of the tunnels just above the tank top, permitting a low center of gravity and an under cargo feed.

A 4-yd. scraper, open top and bottom, is operated in each tunnel to drag the material through the tunnel and up an incline to a hopper. From the hopper the material is fed to a 10-in. Fuller-Kinyon pump which discharges the material through an 8-in. pipe line to the storage silos on shore. The scrapers are each operated by a hoist with a 100-hp. Bruce Peebles induction motor, and the pump by a 300-hp. direct-connected motor of the same kind. Compressed air for the pump is supplied by two 1000 cu. ft. per min. Reavell air compressors, each driven by a 200-hp. motor.

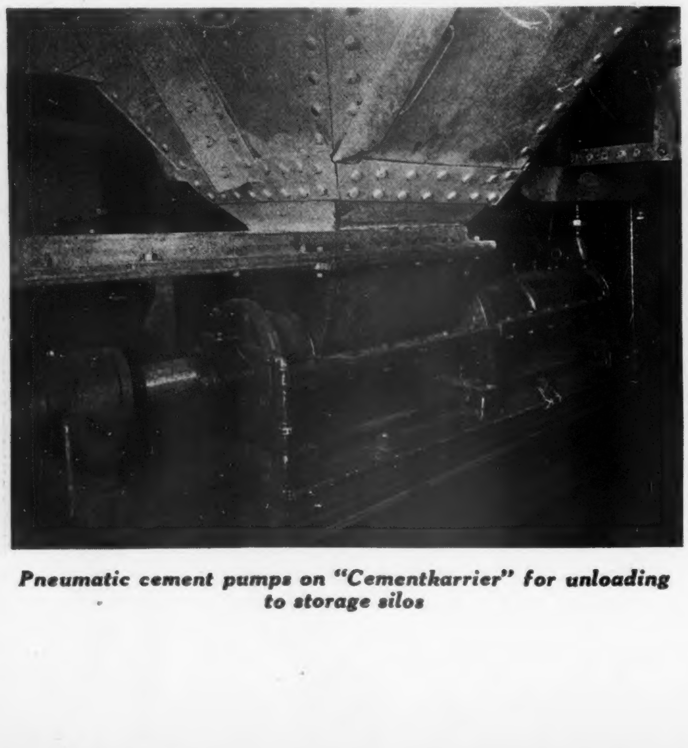
The backhaul cable of each scraper is reeved through a trolley running on an I-beam at the apex of the tunnel, so that during the backhaul operation the rear end of the scraper is raised and returned over the top of the material.

This unloading system is known as the "Leatham D. Smith patented tunnel scraper system" and was devised by Leatham D. Smith of the Leatham D. Smith Dock Co., Chicago, Ill. The scraper bucket used is a Sauerman "Crescent" type.

The men who operate the scrapers work under a slight air pressure so that dust is prevented from entering their control rooms. These two operators are a part of the boat's total crew of 23 men.

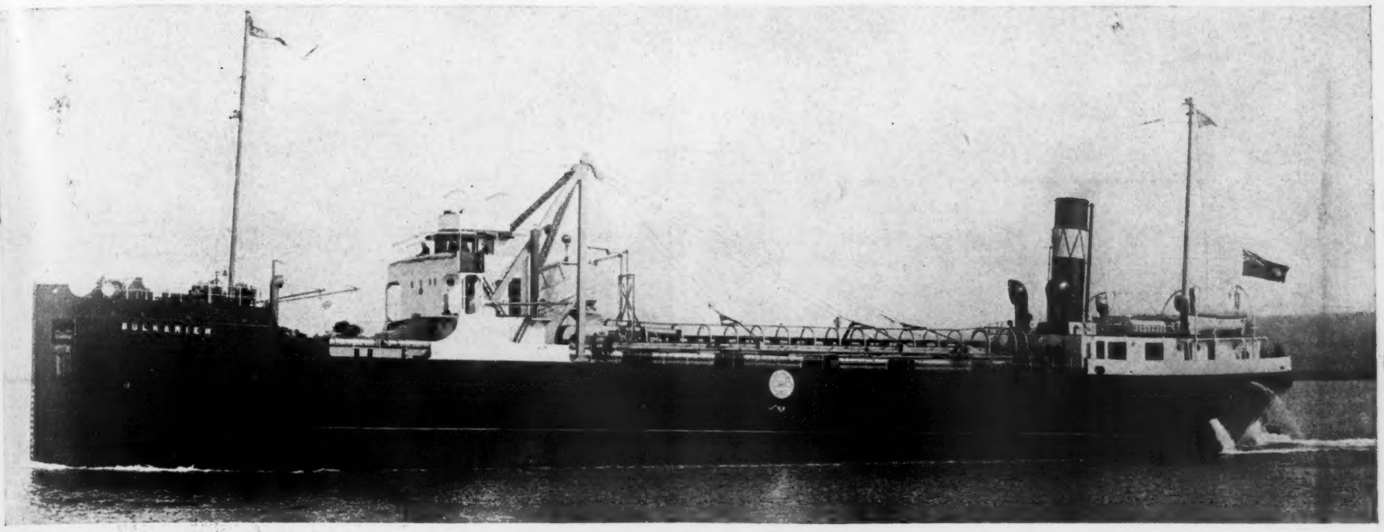
The machinery was installed by the Furness Shipbuilding Co.'s electrical and engineering department, with the electrical propelling equipment supplied by the General Electric Co., Ltd., which also supplied the main switchboard and the greater part of the auxiliary electrical equipment.

All of the power equipment, Diesel engines, compressors for the Fuller-Kinyon



Pneumatic cement pumps on "Cementkarrier" for unloading to storage silos

Hopper and screw conveyor feeding inclined belt that serves the Montreal silo docks



"Bulkarier" for handling bulk cement and gypsum

pumps, ice plant, switchboards, etc., are located aft, and the forward end is utilized for the duplicate 4-yd. scraper bucket drive equipment and the 10-in. Fuller-Kinyon pump that delivers to shore storage. Over the bucket and pumping equipment is located the wheel house and captain's quarters.

Four warping winches, two forward and two aft, each direct-connected to 18-hp. motors and with controls at the winches, provide a positive control of the shore lines without excessive jerking or unnecessary strains. These winches were supplied by the Sunderland Forge Co., of England.

Electric power for propulsion and for the unloading equipment is generated by two 500-hp., 4-cylinder Atlas Diesel "Polar" engines, Type K34M, 220 r.p.m., each direct-connected to two 350-kw., 220-r.p.m., 440-v., 823-amp. General Electric Co., Ltd. (of England) generators. The propellor is driven by a 775-hp., 440-v., double-armature type, 100-r.p.m., induction motor direct-connected to the propeller shaft. This is in reality two motors on the same shaft, one of which can be used for maneuvering while in port or for slow speed, and both for regular operating speeds. This motor was made by the General Electric Co., Ltd., Witton, Birmingham, England, and is air-ventilated. It is at all times under control from the wheel house as well as the generator room and can be changed from full speed ahead to full speed astern in 20 seconds.

The engines were designed to have a fuel consumption of 0.375 lb. per b.hp. hr. at both full and three-quarter operating speed, and even at half loads not to exceed 0.385 lb. per b.hp. hr. Actual operations reveal a fuel consumption of 3½ tons per 24-hr. day.

Each engine also drives a 50-kw., 220-v. compound wound generator, which is direct-connected to the extended shaft of the 440-v. main generator. This smaller generator supplies auxiliary power for lighting and other uses in the engine room.

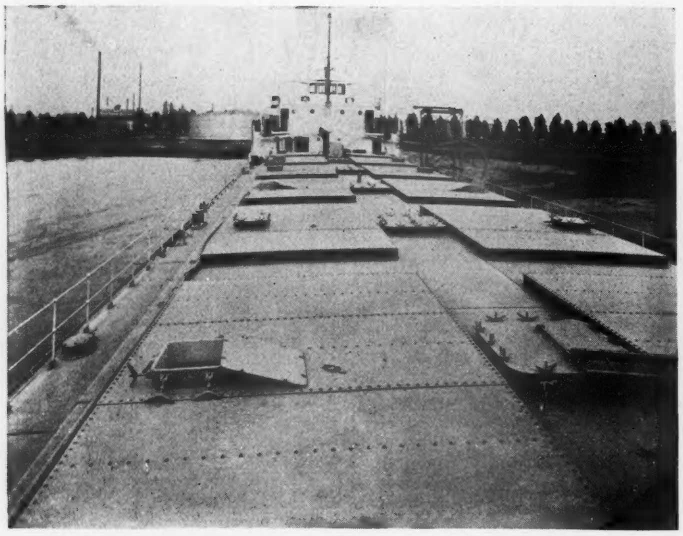
There are also two 30-kw., 220-v. Diesel-engine-driven generator sets for emergency use, which may be run in parallel with the 50-kw. generators. When in port the main generators are run as compound wound machines in parallel to supply the unloading machinery, and in series for propulsion. This demand is often up to the maximum output of 360 kw. each, when operating the unloading equipment. The Ward-Leonard system of field control is used with motor-driven field regulators.

In the event of total power failure, automatic accumulators or storage batteries are provided that are of sufficient capacity to handle the electric steering mechanism and navigation lights.

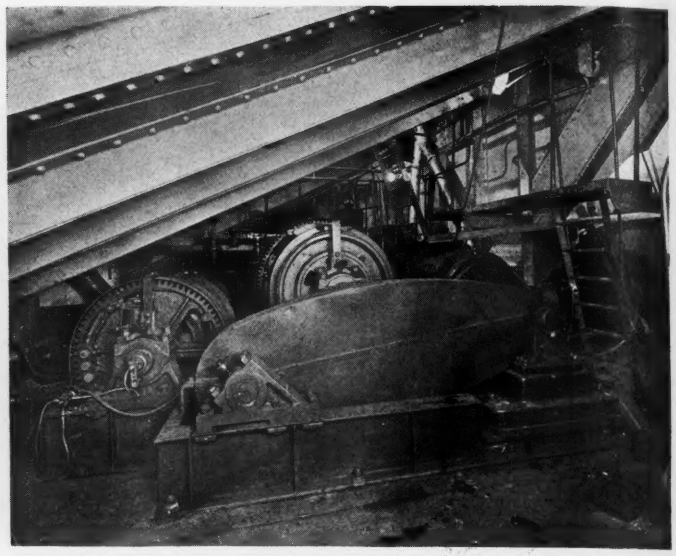
The method of control between the wheel house and the engine room is covered by four control positions, one control pillar being in the wheel house, one on the flying bridge, one in the engine room and a manual control pillar in the engine room. The first three pillars are standard bridge telegraphs. The two bridges are mechanically coupled but in an emergency the engineer can take control by throwing a switch that automatically cuts out the bridge control. In this case the engine room takes orders by telephone or telegraph. Again, should the electrical control fail from any cause, the engineer can open a door in the regulator, thus exposing a hand wheel for manual operation. Opening this door automatically makes the change over from electric to manual control. This transfer of method of control also is audibly and visually signaled to both the engineer and navigator.

Another interesting feature in connection with the control method between bridge and engine room is that the navigating officer can control the propeller's driving motor speed and is guided in this by an indicator

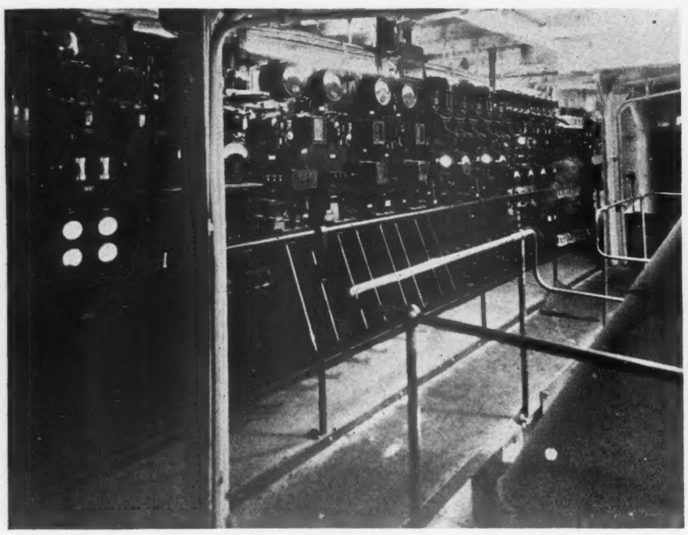
Deck of "Bulkarier"



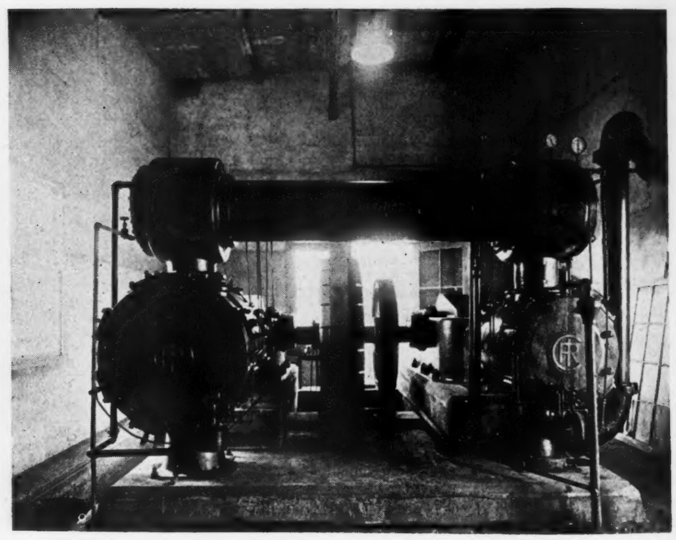
Deck of "Cementkarrier" looking toward wheel house



Motor-driven hoist for scrapers in "Cementkarrier"



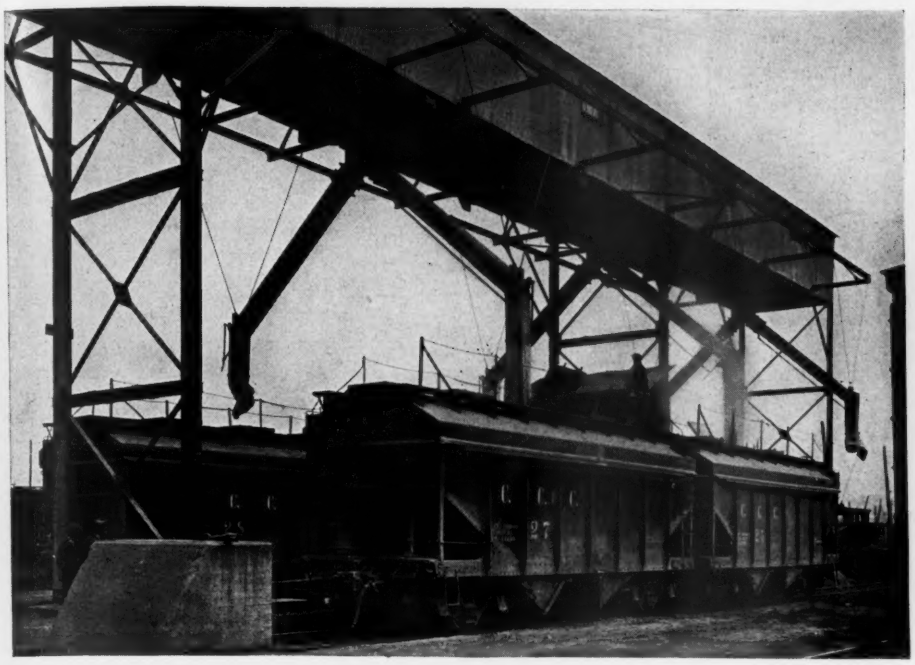
Electrical control of "Cementkarrier" centers here



Compressor at Montreal docks supplies air for loading

Silo, with crane for handling coal and gypsum, and boat at right

At left is seen the inclined conveyor serving the silo; at right, the compressor house



Special cars at Montreal plant for delivery to trucks

that shows the corresponding r.p.m. of the propeller.

The main generators and auxiliaries are controlled through a 14-panel switchboard located in the engine room, while the Fuller-Kinyon pump and scrapers are controlled through a separate 440-v. two-panel switchboard located forward.

Bulkarier

The other ship, the *Bulkarier,* which was put into service during the summer of 1929, was also built in England by the Furness Shipbuilding Co.

It is likewise equipped with the Leatham D. Smith patented tunnel scraper system, using two 4-yd. Crescent scrapers, but on account of handling crude gypsum rock as well as bulk cement, a belt conveyor system is used instead of the pumping system as on the *Cementkarrier.*

From the hopper into which it is carried by the scrapers, the material is fed to a 48-in. inclined belt conveyor running up through the deck and discharging to another 48-in. belt mounted on a 90-ft. boom, which is swung around over the dock at either side. During the unloading operation this boom belt conveyor is enclosed in a canvas housing, which simple precaution practically eliminates all dust.

The principal dimensions and data on the boat are as follows:

Length	253 ft.
Width	43 ft.
Depth, molded	25 ft.
Speed	8 knots per hour
Cargo capacity	12 000 bbl. cement
or	2500 tons gypsum
Loading time:	
Cement	18 hrs.
Gypsum	5 hrs.
Unloading time:	
Cement	17 hrs.
Gypsum	9 hrs.

This boat is driven by a 1250-hp. triple-expansion steam engine supplied by the Earles Shipbuilding Co., Ltd., of Hull, England, and has two single-ended multi-tubular boilers 13 ft. by 11 ft. long with 3350 sq. ft. of heating surface, which are oil fired. All of the unloading machinery is steam driven.

Cement Loading

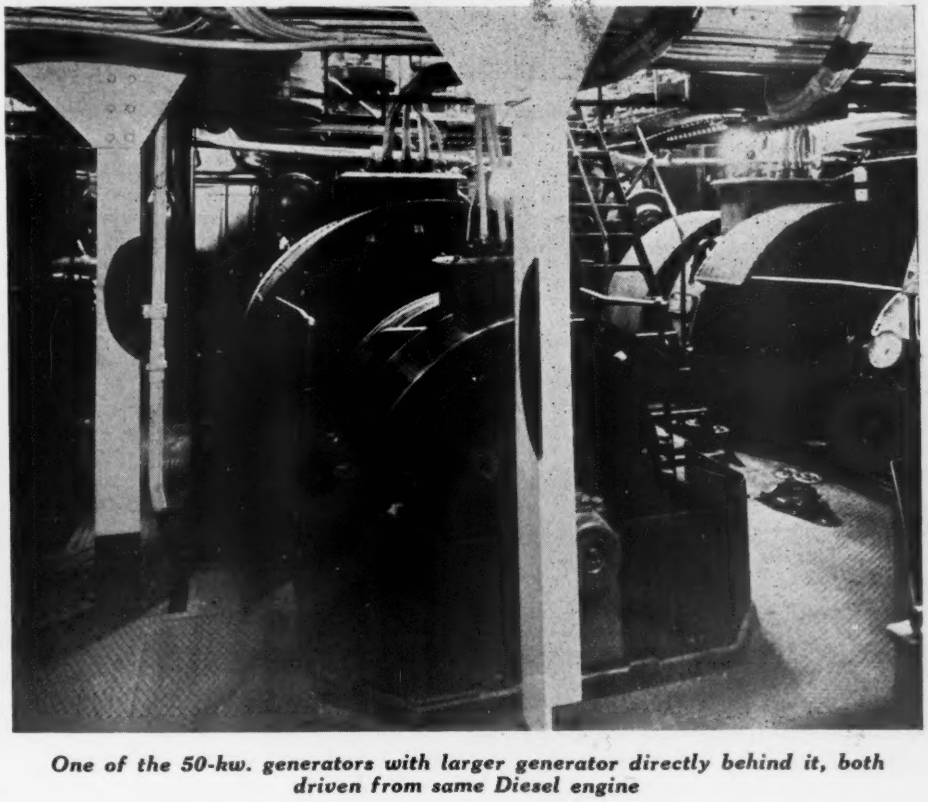
The method of loading the *Bulkarier* at the Montreal No. 1 plant of the Canada Cement Co. is unusual and novel, since the plant is back about a half-mile from the water's edge. The bulk cement is loaded into specially designed, covered, standard-gage, 55-ton capacity, hopper-bottom steel cars by a system of overhead conveyors discharging through spouts to the cars. The cars are then moved to the wharf by an electric locomotive of the Montreal Tramways Co., where a 30-ton Plymouth gasoline locomotive owned by the cement company takes care of any further switching.

There the cars are spotted over a steel track hopper, and the cement discharged into it. Attached to the bottom of this hopper is a special non-flooding screw conveyor, which feeds a uniform stream of cement on a 42-in. inclined belt conveyor carrying up to a concrete silo. From the silo, which has a capacity of about four carloads, the cement feeds to a 10-in. Fuller-Kinyon pump, which discharges it through an 8-in. pipe line to the boat. The belt conveyor feeder is driven through a Cleveland gear reducer by a 10-hp. Lancashire motor, while the pump is driven by a direct-connected 250-hp., 875-r.p.m., 2200-v. Lancashire motor.

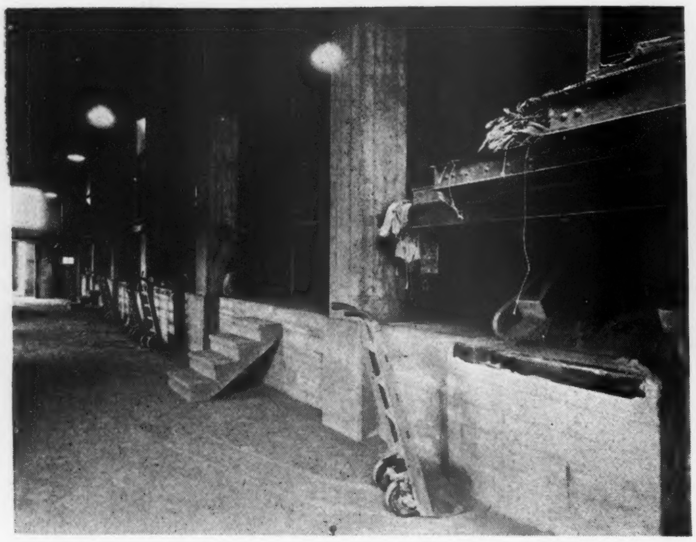
Air for operation of the cement pump is produced by a 26x16¼x18-in. Imperial, Type PRE2, 225-r.p.m. Canadian Ingersoll-Rand compressor that is direct-connected to a 400-hp. Canadian General Electric, Type TS, 225-r.p.m., 320-kva., 2200-v., P. F. 100, synchronous motor. The loading operation requires 1625 cu. ft. of air per minute.

Gypsum Unloading

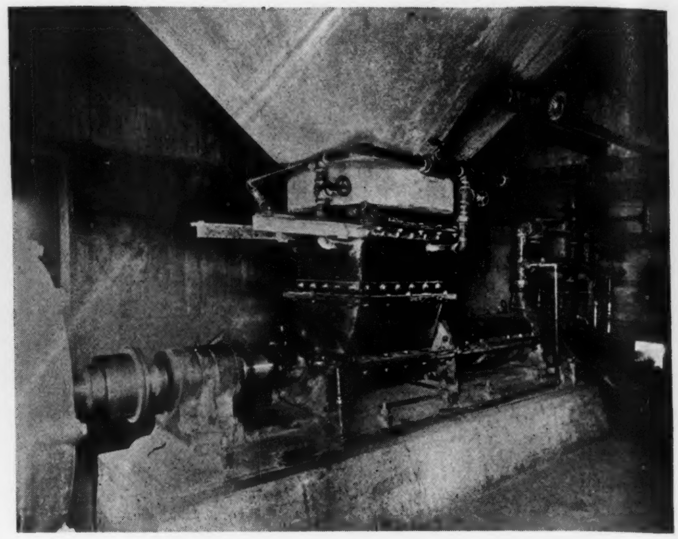
The crude gypsum from Nova Scotia is crushed down to minus 4-in. size before loading and is shipped in that condition. Upon arrival at Montreal the unloading boom is swung around over the dock and



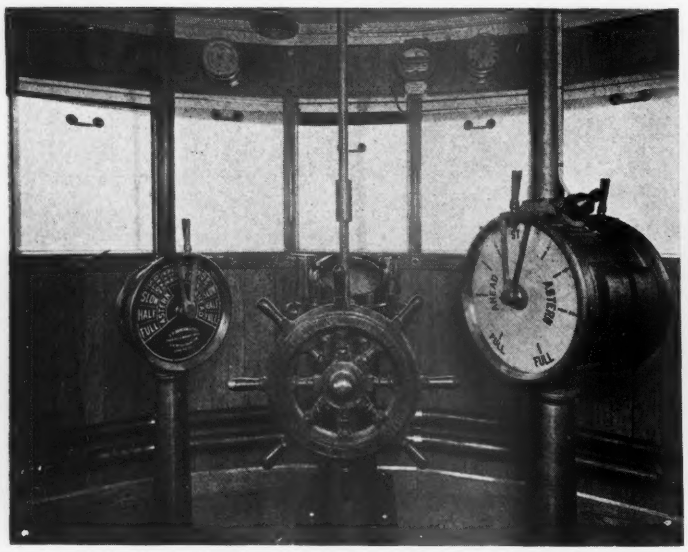
One of the 50-kw. generators with larger generator directly behind it, both driven from same Diesel engine



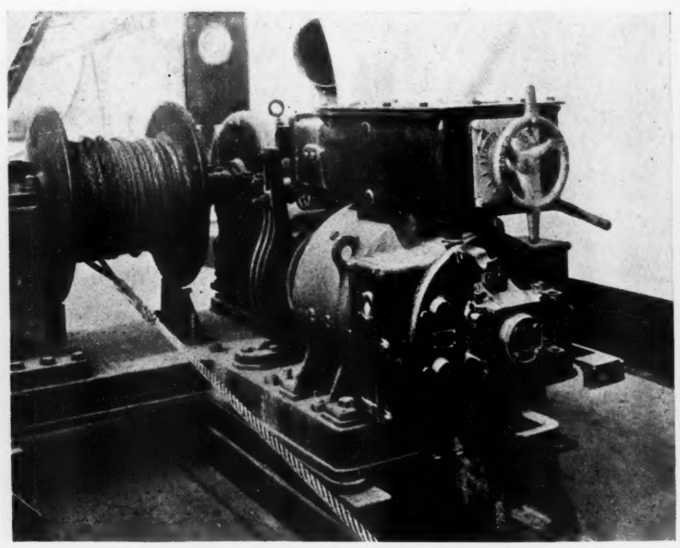
Interior of packing plant at Toronto



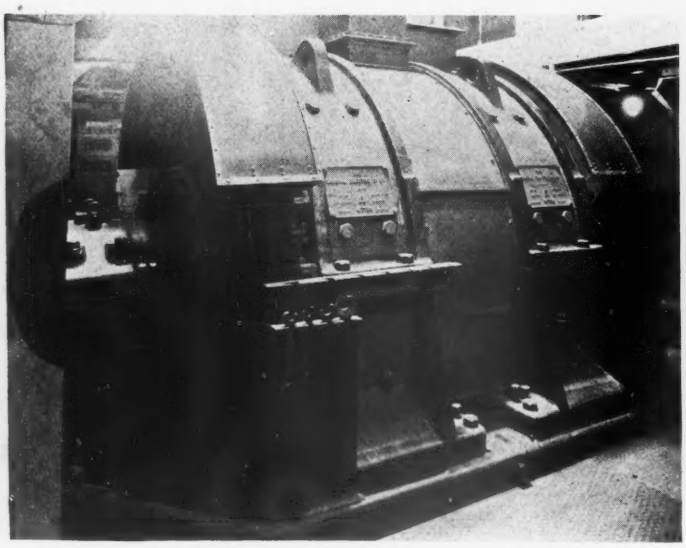
Pump for delivering cement to boats at Montreal plant



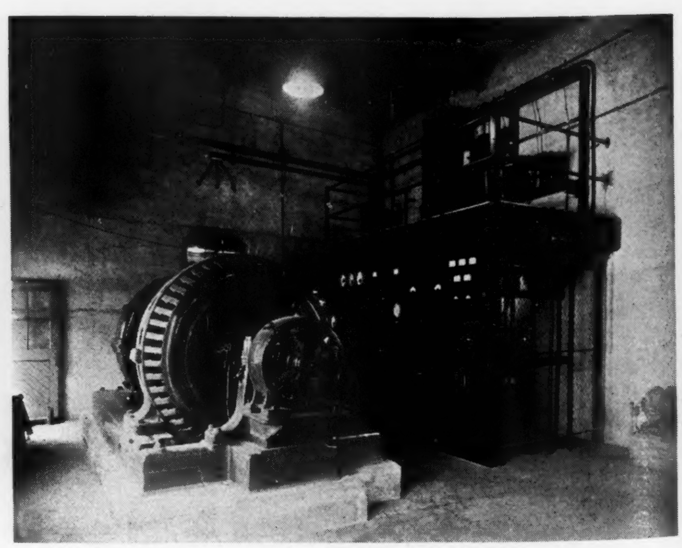
Pilot house of "Cementkarrier"



Shore lines are controlled by four electric winches



Double armature motor which drives propeller shaft of "Cementkarrier"



Motor generator set and switchboard for control of yard crane at Montreal docks

All-electric boat "Cementkarrier" unloading at Toronto packing plant

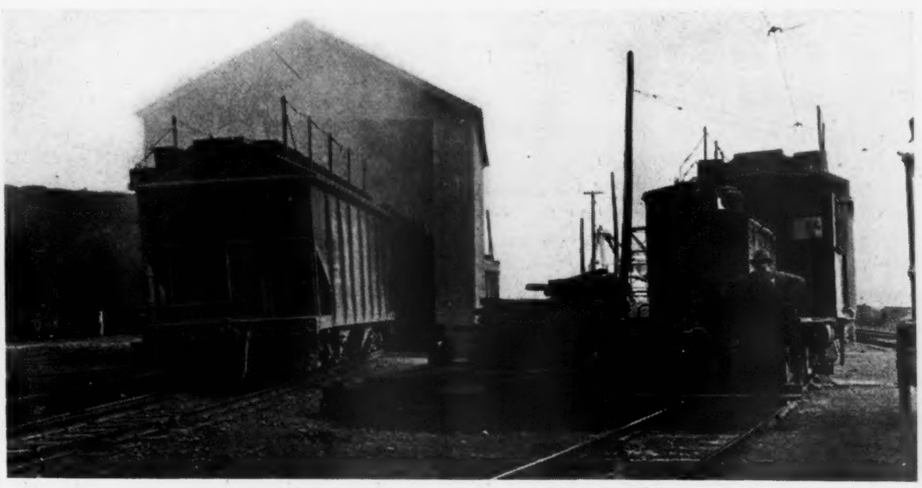
the crude gypsum unloaded by means of the scrapers and belt conveyors directly into gondola railway cars for delivery to the cement plant.

The design of the hoppers making up the top of the scraper tunnels in the boat are such that only a small part of the gypsum cargo has to be scraped or handled by hand in order to get it into the scraper tunnels. It was said that about one hour's time of the crew of 10 men would take care of any gypsum that hung up while unloading.

E. Knudsen is captain of the *Cementkarrier;* Lloyd Jenkings, captain of the *Bulkarier,* and A. Leamy is dock superintendent at the Montreal shipping point.

Packing Plants

The Toronto packing plant of the Canada Cement Co., Ltd., is typical of the four other packing plants. The other packing plants are at Windsor, Ont., Quebec, Que., St. John, N. B., and Halifax, N. S. All these plants were designed and built by the engineering department of the cement company.

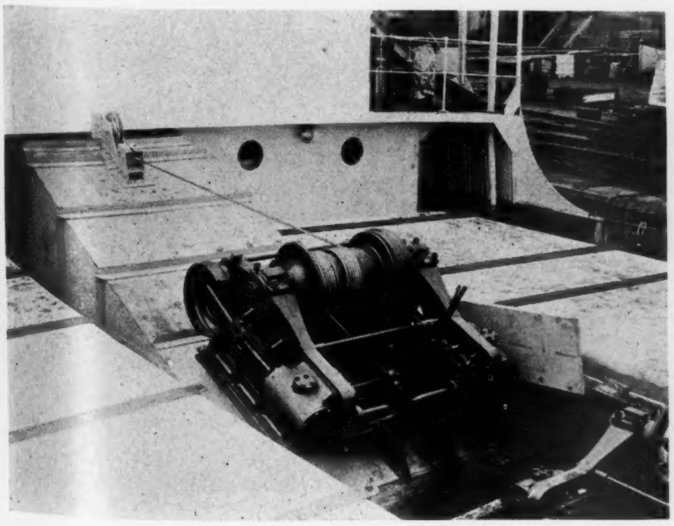


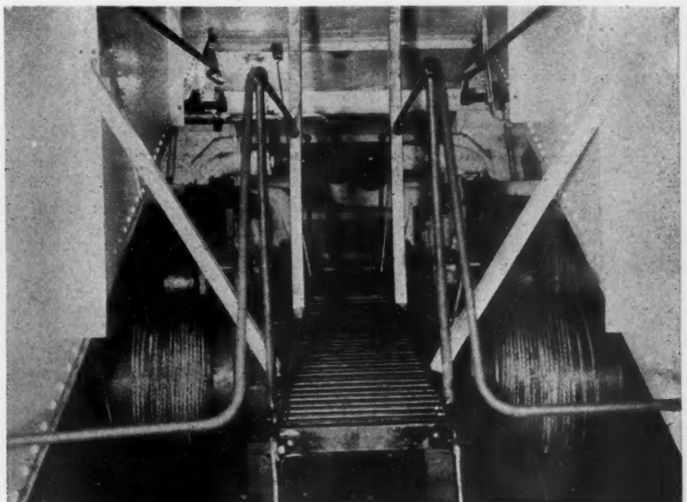
Car of bulk cement being unloaded at Montreal docks

The Toronto and Windsor plants are filled by means of 8-in. pipe lines from the cement boats, while those at Halifax, St. John and Quebec City are provided with belt-conveyor systems that receive the cement from the unloading belt of the boat and deliver it to the storage silos at these points.

The Toronto plant is located on Carlton street at the foot of Cherry street and has four reinforced-concrete silos with star interstice bins that hold a total of 90,000 bbl. of cement. J. Johnson is superintendent.

The four silos and their star interstice bins discharge through 36 outlets, each outlet provided with a Fuller cement gate that feeds the material to six parallel screw conveyors serving two bucket elevators. The bucket elevators discharge to short cross screw conveyors that feed four steel bins mounted over four 3-tube Bates packers. All of the various units are driven



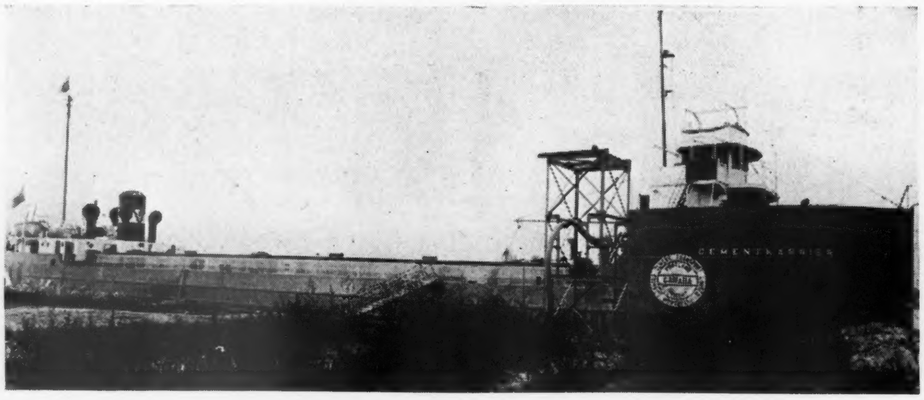


Equipment for handling boom on "Bulkarier"

by Canadian General Electric motors through Cleveland gear reduction units. Dust is collected from the various sacking machines by the Sly dust collectors that are mounted on the floor above the packers.

A one-man Roeper electric hoist is provided for handling empty sacks from the storage space over the packing room. This hoist is mounted on an I-beam that traverses the length of the storage space so that empty sacks can be raised or lowered to the packing room below. Both paper and cloth sacks are used at Toronto.

The general layout of the packing plant is such as to permit both the loading of trucks for the Toronto deliveries and the loading of cars for the more suburban markets.



Equipped with pumps to deliver cement through an 8-in. line a distance of 370 ft.

Promoting Ready Mixed Concrete Use

SELLING IS ONE of the most important requirements in the successful operation of a ready mixed concrete plant.

To assist in this department of its business the V. E. Schevenell Construction Co., Memphis, Tenn., has prepared a 4-page folder which tells the advantages of using ready mix, illustrates jobs on which it has furnished the concrete, and suggests various kinds of work where its product may be used to advantage.

The application of modern merchandising methods to the ready mixed concrete business will do much to establish it as an important economic development in construction work.

Mineral Earth Pigments

THERE ARE MANY types of mineral earth pigments, but perhaps of chief interest to industry is the group of oxides comprising red oxide of iron, ocher, sienna, and umber say, E. C. Wood and E. A. Kiefer, Jr., in *Commerce Reports*. These pigments are composed principally of clay permeated by hydrated iron oxide, which, together with manganese present in sienna and umber, furnish the color. Because of the large quantity of iron contained in the earth's crust, numerous deposits of mineral earths are found throughout the world. Notwithstanding the abundant world deposits of iron ore, some have not been exploited for pigment purposes, owing to their low iron content. Although sufficient quantities of iron ores are available in the United States, the quality of the ore is unsuitable for the manufacture of certain high-grade pigments used for paint purposes.

Accurate statistics showing the domestic production are not obtainable, under the general classification, however, designated as "iron oxides" which includes natural and artificial red oxide of iron, ocher, sienna, and umber, the total output in 1929 amounted to 106,060,392 lb., valued at $3,381,280.

Although considerable quantities of the domestic production are consumed in the manufacture of paints, wallpaper, rubber, linoleum, printing inks, and abrasives, large amounts also are exported annually.

Total exports of mineral earth pigments during 1930, amounting to 45,132,189 lb., valued at $535,193, showed an increase of more than 7% in quantity over shipments of the preceding year, although they declined 38% in value.

Canada is the outstanding outlet for American iron oxide pigments, taking annually 40 to 45% of the total exports.

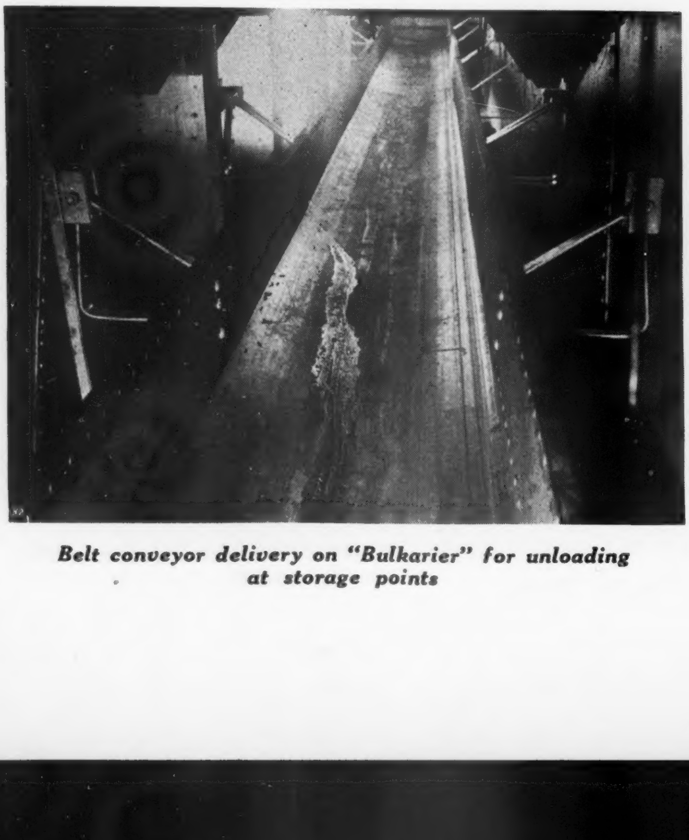
Spain is the principal foreign source of imports of natural red oxide of iron, although smaller deposits are found in many other parts of the Mediterranean area.

France is the leading foreign source of ochers consumed by the American paint, ceramic, and other industries, furnishing annually 8000 to 9000 short tons.

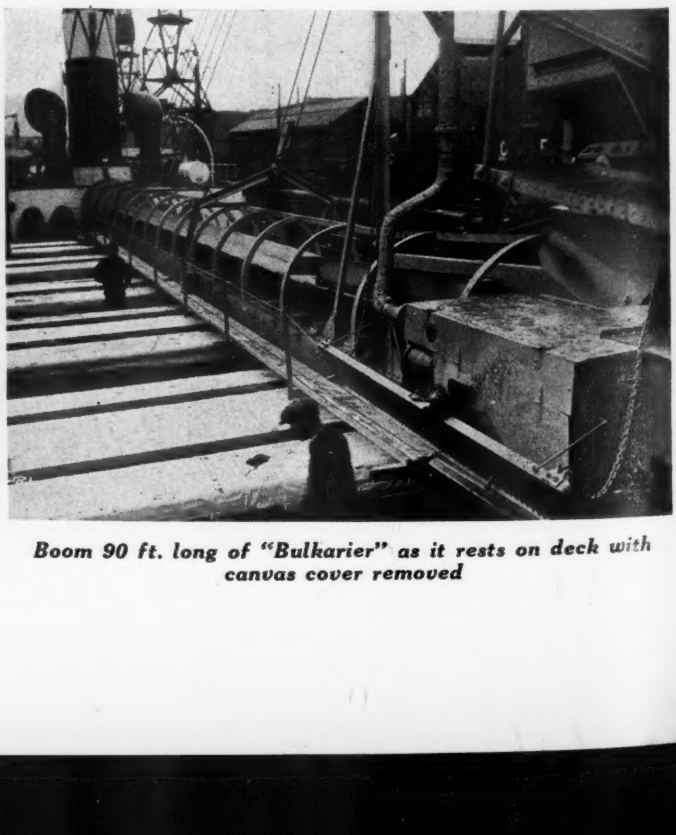
Italy is the principal world source of sienna earth pigments. The term sienna is applied to ochers converted by a process of calcination into a product ranging in color from golden brown to blood orange, and found originally in the province of Sienna, Italy.

Umber is produced in many countries, although the finest qualities are found in Cyprus, Sicily, and Asia Minor. Turkish umber, chiefly from the island of Cyprus, is the standard.

At present the principal countries of origin are the suppliers of standard high-quality products. However, considerable interest has been manifested in recent years in the commercial possibilities of new deposits of mineral earth pigments.



Belt conveyor delivery on "Bulkarier" for unloading at storage points



Boom 90 ft. long of "Bulkarier" as it rests on deck with canvas cover removed

Economics of the Nonmetallic Mineral Industries*

Part IV—Financing a Rock Products Project

By Raymond B. Ladoo
Manager of the Industrial Commodities Department, United States Gypsum Co.

Abstract

ROCK PRODUCTS ENTERPRISES (and others also) often fail from insufficient cash capital because of lack of foresight, or excess optimism, regarding the actual costs—not merely of building a plant, but of keeping the business afloat until on a profitable operating basis. Also going concerns that have been profitable often fail when consolidated by promoters into an organization with an excessive capital structure. In both cases the promoters may win out through "luck"; but both author and editor are in favor of eliminating "luck" as a business asset, so far as possible.—The Editor.

PERHAPS one of the commonest causes of failure of most nonmetallic mineral ventures (as well as most other industries, for that matter) is improper and usually inadequate financing. Over-financing, too, is not uncommon and may lead to disaster, but lack of sufficient capital is the most common trouble.

Let us say that a group of business men are interested in developing a feldspar deposit. One of them takes the initiative and gets together some data on markets and selling prices and persuades the others that they could profitably enter the feldspar business.

They hire a quarry superintendent or foreman or contractor or young engineer and begin to draw up their plans. They get prices on machinery and estimates on building costs. They add the two together and perhaps allow 10% more as a factor of safety. The total may be $60,000. Perhaps they then add $10,000 more for working capital, and between them they raise the $70,000. They then incorporate their company, issue their stock and go ahead.

The first snag they strike is that their estimates were too low even with the 10% added as a margin of safety. Before their mill is completed it has cost them close to their $70,000. Then they find out they forgot to estimate the cost of opening their quarry, grading roads, building a railroad siding, etc. They are short of money before they start. With some grumbling and dissatisfaction they manage to scrape together another $25,000 or $30,000 and finally get into operation.

They start to grind feldspar and at the same time start to try to sell it. But that proves to be not so easy. They have a new and untried product. They are unknown in the trade and it is difficult even to get their product tested out. Prices, too, do not look so attractive. They find a range of prices and purchasing agents not inclined to be interested except at the lowest competitive price or a little lower.

Must Break in on Low Price Basis

Eventually by quoting very low prices they begin to get a few orders. Months roll by and still they are producing nothing like their theoretical capacity of 100 tons per day, and collections are slow. But salaries and payrolls and power bills must be met right along. They need more money to keep their heads above water. This time it is still harder to raise the money. Bill Jones has sunk all he had and so has Jack Brown. One or two of the group, a little more fortunate, can supply the deficit but they do it only on extortionate terms. The immediate crisis is met, but it is only a temporary stop-gap.

But why go on? Everyone knows how the poor company drags along, always in difficulty, until a business slump or a price war or some other common mishap occurs and then it fails or is sold out at a low price to a competitor. Their product may have been good and under proper conditions they might have succeeded. All they may have lacked was adequate capital to build their plant, open their quarry and carry them along on a sound basis during the two or three or four lean years while they were getting established and developing their markets.

Lack of Adequate Capital Common Industrial Ill

Lack of capital may not always kill a company but it may so stifle its growth that real worthwhile success may not be attained. Sometimes the investment of a few thousand dollars in a piece of machinery opens up a new and very profitable field of production and the lack of that few thousand dollars holds the company down to a bare living basis.

Sometimes a company may get on a sound profit-making basis within a year and sometimes it may take five or eight or ten years (if the company can hold out that long—most cannot). One company making a high grade, high priced, technically controlled nonmetallic mineral product was founded seven years ago and this year is just beginning to be really successful financially. Its product was good, unusually good, but this product was new and high priced and difficult and costly to make. All sorts of misfortunes occurred. The plant was burned down a couple of times; processes went wrong. Yet by sticking to it and managing to get along financially this company is making an outstanding technical and financial success today.

Time Needed to Develop Satisfactory Production

In addition to the slow development of markets as a reason for non-profit-making initial years, we have a similar factor on the production side of the picture. A fact not always taken into consideration is the length of time needed to develop a new quarry to a point where a large daily production may be secured. In opening up a new deposit of limestone, let us say, for making crushed stone, it takes considerable time to develop a large working face, particularly if there is much overburden to be removed. It may take a year or more to get a quarry into shape for efficient, large scale production.

A good example of this occurred a few years ago. In a large eastern city a group of men decided that a new large crushed stone company with efficient equipment would be a paying proposition. These men were able, well-to-do business men and one of them was an executive in a large company producing lime and portland cement. So they should have been able to judge the situation accurately. They were powerful enough to influence sales in large volume and they found a deposit of good stone located close to the city. Capital was readily raised to build a modern, well equipped plant capable of producing several thousand tons of stone per day. The plant was built

and a start made on opening the quarry. When the plant started operation contracts were signed for the delivery of large tonnages of stone. But soon it was discovered that their large plant would operate only at a small fraction of its capacity, because the quarry could not produce stone fast enough. They found that it takes a long time to develop a large working face, and little could be done to speed it up. They could not fulfill their contracts, and either had to buy stone from their competitors or forfeit the business. In the meantime their payroll and plant charges consumed their working capital. In the end they went into bankruptcy and were bought out by a competitor whom they had confidently expected to put out of business.

Over-Financing

Over-financing is a totally different problem. It is usually the result of over-zealous or unscrupulous promotion. The promoters get options on a going business or a deposit or a group of plants, organize a company with a capital far in excess of the needs of the business, sell the stock at a discount and in addition take a large share of the stock sales as their commissison, buy the plants and go ahead. The net amount of money returned to the business is often only 50 to 55% of the par value of the stock sold. Such enterprises do not have a chance, unless they are unexpectedly profitable producers, because they will be expected to return a fair yield on a heavily inflated capital structure. While they may not have an excess of ready cash, they are much over-financed as far as their ability to pay dividends is concerned. The original stockholders get no return on their investment. The companies are always in a weak financial condition and when the stress of hard times or low prices hits them they are forced to the wall.

(To be continued)

Coal in the State of Washington

AMONG THE LARGEST industrial consumers of coal in the state of Washington are the cement mills, which in 1927 used a total of 225,000 tons of coal or from 6 to 8% of the entire output. The great bulk of that used in the western Washington mills came from Washington mines; in eastern Washington competing fuel from outside the state is employed to some extent.

This information is contained in technical Paper 491, "Analyses of Washington Coals," recently issued by the United States Department of Commerce.

The report gives the location, special features, producing districts, geologic structure and coal reserves of the state in addition to a description of mining methods and preparation of coal, and detailed information and analysis of all major, and many deposits of lesser, importance in the state.

Effect of Calcium Chloride on Portland Cement

A STUDY HAS been made in an effort to determine just what the action of calcium chloride on portland cement may be. This investigation by E. C. Shreve, fellow in 1929, and W. D. Foster, fellow 1929 and 1930, under the direction of Professors R. C. Sloane and W. J. McCaughey, the Ohio State University, was carried on in cooperation with the Calcium Chloride Publicity Committee and is reported in the *Engineering Experiment Stations News*, Ohio State University.

Portland cement, it says, is composed mainly of three minerals: tricalcium aluminate, tricalcium silicate and δ dicalcium silicate. Tricalcium aluminate starts to hydrate as soon as water is added. Tricalcium aluminate is completely hydrated in about 24 hours and is responsible for the initial set. Tricalcium silicate starts to hydrolize within 24 hours, part or all of the lime in it dissolving out because of incongruent solution, and what is left hydrating and forming a gel. This reaction is responsible for the increase in strength from one day to about 30 days. Beta dicalcium silicate hydrolyzes much the same as the tricalcium silicate, and is responsible for increases in strength after 30 days.

Effect of $CaCl_2$ on Mineral Components of Cement

In this investigation, tricalcium aluminate in water was found to hydrate completely in about one day. In 5% $CaCl_2$ solution it hydrated much slower. This reaction requires about 2 or 3 days.

Tricalcium silicate hydrates more rapidly in 5% $CaCl_2$ solution than in plain water. The results of this study indicate that δ dicalcium silicate also hydrates faster in 5% $CaCl_2$ solution.

Beta dicalcium silicate in plain water is about 6% hydrated at 14 days, 29% at 30 days and 34% at 90 days. In 4% $CaCl_2$ solution δ dicalcium silicate is about 9% hydrated at 14 days, 34% at 30 days, and 35% at 90 days.

Tricalcium silicate in plain water is hydrated about 60% at one day and completely hydrated at about 30 days. Tricalcium silicate in 4% $CaCl_2$ solution seems to be completely hydrated at one day. However, tricalcium silicate in 8% $CaCl_2$ solution is about 84% hydrated at one day and completely hydrated at about 5 days.

Effect of $CaCl_2$ on Portland Cement

Portland cement in plain water is hydrated about 13% at one day, 73% at 30 days, and 79% at 60 days. Portland cement in 4% $CaCl_2$ solution is hydrated about 16% at one day, 46% at 3 days, 65% at 30 days, and 83% at 60 days. It can be seen from these figures the hydration of cement is accelerated at first by calcium chloride, then decelerated, then accelerated again, as compared to the rate in plain water. The deceleration is enough by 30 days to make the amount of hydration in calcium chloride solutions less than the amount in plain water.

A small part of the calcium chloride in the hydrating solution is taken up by the portland cement. All the evidence shows that this probably goes into combination with part of the tricalcium aluminate to form calcium chloraluminate, $3CaO \cdot Al_2O_3 \cdot CaCl_2 \cdot 10H_2O$. No evidence was found of compounds being formed by calcium chloride and the calcium silicates or their hydration products.

Tests seemed to prove positive adsorption of the calcium chloride on the portland cement. Tests on the action of calcium chloride on a silica gel, such as may be supposed to coat a cement particle, seemed to show that the calcium chloride made the gel much less permeable.

Effect on Mortar

To determine the difference in loss of moisture between calcium chloride treated mortar and plain mortar, under all conditions tested the calcium chloride treated mortars held more moisture. They lost moisture more slowly under dry conditions, such as exposure in the air and baking at 38 deg. C. in an oven. They picked up moisture faster under humid conditions such as storage in a damp room or buried in moist sand.

Volumetric tests were made. Relative humidity was found to be one of the most important factors affecting volumetric change and as this was not controlled, the results on volumetric change are rather uncertain.

A complete report of this study is now being prepared.

Abrasive Materials in 1930

THE PRODUCTION OF miscellaneous abrasives sold by producers in the United States in 1930, as reported by the United States Bureau of Mines, Department of Commerce, is shown in the following table:

	1930	
	Short tons	Value
Emery	555	$ 5,996
Garnet	5,003	314,129
Grinding pebbles and tube-mill lining	3,480	50,816
Grindstones	14,559	423,835
Millstones, chasers and drag-stones	....	17,702
Oilstones, whetstones, hones, scythestones, and rubbing stones	651	137,184
Pulpstones	4,141	346,736
Pumice	56,843	336,099
Tripoli	32,439	507,505

In addition, there were manufactured and sold during the year 84,901 short tons of artificial abrasives, valued at $7,091,373, divided as follows: Carbides, 22,008 short tons, valued at $2,047,188; aluminum oxides, 46,465 short tons, valued at $4,067,148, and metallic abrasives, 16,428 short tone, valued at $977,037.

Lime Production Methods of Europe and America

Part IV—How the Properties of Limestone Affect the Burning and Subsequent Properties of the Lime

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

Synopsis

As with the previous installment the text is not in exact accord with the title—its relation to European practice is inferential. That is to say, in Europe study and research have been made of the properties of lime, and what causes them; while in this country the lime industry has been largely barren of such work.

By means of charts the author has developed and made clear many of the properties of lime and what causes them—the properties of the original stone, the temperature and time of burning, the molecular structure of the lime itself.

In this installment the author gives the results of much original research to determine some of the physical constants of lime, so necessary to any intelligent discussion or study of the properties of lime.

These articles are well worthy of the intensive study of all who would acquire some technical knowledge of lime. And, as the author bluntly says, there is no other road to success in the lime industry than the acquisition of such knowledge.—The Editor.

With this fourth part of the series, we must go to work. It is nice to delve into the distant past, but we have the present staring us in the face. And how is it staring just now! It is fascinatingly interesting to watch the formation of the mineral world, the development of living matter, the animal battle of the survival of the fittest, with the largest dinosaurus, a monster the size of a house, coming up and apparently taking a permanent lease on this world, then suddenly disappearing completely, except for the few bones we are finding today.

It is interesting, but not very productive, unless we accept the lesson it teaches us and apply it to the present industrial upheaval during which many an unadaptable monster will go down into oblivion. Many a lime concern is tottering at the brink and the state of the lime industry, as a whole, is comparable to the physical condition of the proverbial sick man of Turkey. The dinosaurus had a very large body but very small brain, and when cards became stacked against him he pulled in his 60-ft. tail and expired. He just was not made to combat the (to him) unfavorable conditions, to adapt himself to the new ones. The lime man and his industry is just about in the same state. Fortunately his brain is larger; the problem is of putting it to constructive work.

Must Apply Study to the Lime Industry

Now there is no royal road to learning; it means work, study, persistent study, not just hasty reading; careful study of apparently uninteresting figures. If one could just do without it! But one can't. Supposing we want to make cheap lime. Evidently we must have kilns that are efficient, which means that they are properly proportioned and properly fired. No one will disagree with this.

Now the most important part of a kiln is the lime cooler below the burning zone; a kiln just cannot be much good except the cooler is efficient. Also lime cannot be the best except the cooler is right. Now the proper design of the cooler depends upon specific heat and heat conductivity of lime and truly reliable figures about these factors are not available.

While the National Lime Association is trying to make the country "lime conscious" development of fundamental information necessary to bring the industry to a rational state is left to Tom, Dick and Harry. Instead of devoting some money for fundamental research at scientific institutions such as the Bureau of Standards, where the Portland Cement Association has eight men and the Lime Association none, such fundamental research is, at the best, smiled at and called a waste of money.

The lime cooler on a vertical kiln is so important that the difference between right and wrong means at the least a difference of ratio of ½ lb. of lime per pound of coal. So I am safe in saying that because such items as specific heat and heat conductivity are not well known and not practically applied, 90% of the lime-kiln coolers are all wrong and the industry wastes through this item alone at least a half million dollars annually and probably much more.

To give an actual example, an Eastern company has kilns in Pennsylvania. Most of the kilns are hand-fired, and about the same kind of limestone is burned. Conditions are quite equal. However, for some reason fuel ratios at one plant average ½ lb. of lime per pound of coal more than at the other, the only explanation for this being a much deeper cooler.

Properties of Lime Tabulated—"Toughness"

The attached tabulation "Physical Properties of Calcium and Magnesium Elements, Carbonates, Oxides and Hydrates" presents to us some of the more essential information necessary to interpret plant performance as well as quality of the product. Some of the figures will be seldom needed excepting by the deeper student, others are constantly required. There are many other factors that vary with individual limestones that cannot be listed. One of these is "toughness." Some limestones are more tough than others and stand more abuse without spalling. The spalls are likely to pack the kiln and greatly reduce capacity. Toughness of limestone and lime can be measured in an appropriate machine, and the results are very important and necessary when knowledge is desired as to why one kiln in a certain plant has under otherwise similar conditions a much higher capacity than at another. Before building new kilns copied in design from some using different stone, the toughness of limestone and lime should always be first measured. It is entirely possible that a kiln with firm stone burning into firm lime may get by with only a fraction of the kiln draft as compared with some other.

Porosity

Then another individual quality is "porosity," which will also affect the burning rate. Bedford, Ind., oolitic limestone has a pore space of 16% and a specific gravity of only 2.32. Caen Normandy oolitic limestone has a remarkably low specific gravity of 1.9, while a Massachusetts dolomite has a specific gravity of 2.8. Marble ordinarily has a pore space of less than 1% and a specific gravity of more than 2.7.

The conductivity of individual stones

PHYSICAL PROPERTIES OF CALCIUM AND MAGNESIUM ELEMENTS, CARBONATES, OXIDES AND HYDRATES

			Molecular or Atomic Weight	Specific Gravity	Temperature of Dissociation at Atmospheric Press. Degrees F.	Heat of Dissociation B.T.U. per Lb.	Specific Heat Heat Capacity B.T.U. per Deg. F. per Lb.	Heat Conductivity B.T.U. per Sq. Ft. per Hr. per Deg. F. per In.	Melting Point Deg. F	Hardness Mohs Scale	Refractive Index	Crystal System	Unit Cell Dimension	Molecules in Cell	Percentage Distribution By Weight
METALS	CALCIUM	Ca	40.07	1.53	—	—	122°F .05 302 .14 482 .15		1490	1.5		C	5.56	4	Ca 100%
	MAGNESIUM	Mg	24.32	1.741	—	—	122°F .060 302 .210 482 .240		1123	2.0		H	a_o 3.22 c_o 5.23	2	Mg 100%
CARBONATES	CALCITE CALCIUM CARBONATE	$CaCO_3$	100.07	2.711	100% CO_2 1648°F 30% CO_2 1525°F	To CaO and CO_2 772.6 at 81°F 679.5 at 1648°F	212°F .208 392 .230 752 .270	122-212°F 17.82 212-302 15.21 302-392 12.05	2352 at 110 Atmos.	3	ω 1.6583 ε 1.4864	H	6.36 46°6'	2	CaO 56.0% CO_2 44.0%
	ARAGONITE CALCIUM CARBONATE	$CaCO_3$	100.07	2.934	To Calcite at 827°F		32°F .188 122 .204 212 .212 342 .225 572 .234			3½-4	ω 1.5299 ε 1.6809 γ 1.6854	R	a_o 4.94 c_o 5.72	4	CaO 56.0% CO_2 44.0%
	MAGNESITE MAGNESIUM CARBONATE	$MgCO_3$	84.32	3.037	100% CO_2 1125°F	To MgO and CO_2 581 at 81°F 336 at 1125°F	77°F .200			4	ω 1.7000 ε 1.509	H	5.61 48°12'	2	MgO 47.8% CO_2 52.2%
	DOLOMITE	$CaCO_3 MgCO_3$ or $CaMg(CO_3)_2$	184.39	2.872	100% CO_2 Atmos. $MgCO_3$ – 1393°F $CaCO_3$ – 1648°F 35% CO_2 Atmos. $MgCO_3$ – 1330°F $CaCO_3$ – 1525°F	686 at 81°F	115°F .217			3-4	ω 1.6817 ε 1.5026	H	6.02 47°7'	1	$CaCO_3$ 54.3% $MgCO_3$ 45.7%
	LIMESTONE	$CaCO_3$+$MgCO_3$ and Impurities		Apparent Density 1.9-2.8	As the Components	As the Components		10.4-20.8							
OXIDES	CALCIUM OXIDE	CaO	56.07	3.4			212°F .196 392 .203 752 .210 1112 .217 1472 .220 1832 .225	4.8	4660	Fused Oxide 3-4	1.83	C	4.79	4	Ca 71.5% O 28.5%
	MAGNESIUM OXIDE	MgO	40.32	3.65			122°F .232 392 .261 1112 .291 1832 .323 2732 .356		Pure 5072	Periclase 6	1.7364	C	4.2	4	Mg 60.3% O 39.7%
	BURNED LIME	CaO+MgO + Impurities		Apparent Density 1.45-1.70 and up						Very Soft to 3					
HYDRATES	CALCIUM HYDRATE	$Ca(OH)_2$	74.08	2.343	In Steam 980°F In Air 830°F	To CaO and H_2O 398	32°F .260 122°F .288			2-3	ω 1.644 ε 1.446	H	a_o 3.52 c_o 4.93	1	CaO 75.7% H_2O 24.3%
	MAGNESIUM HYDRATE	$Mg(OH)_2$	58.33	2.4		To MgO and H_2O 290				2½	ω 1.563 ε 1.583		a_o 3.11 c_o 4.73	1	MgO 69.1% H_2O 30.9%
	SLAKED LIME	$Ca(OH)_2$+MgO + Impurities		.4-1.0											

Assembled from various sources, mainly International Critical Tables, by Victor J. Azbe

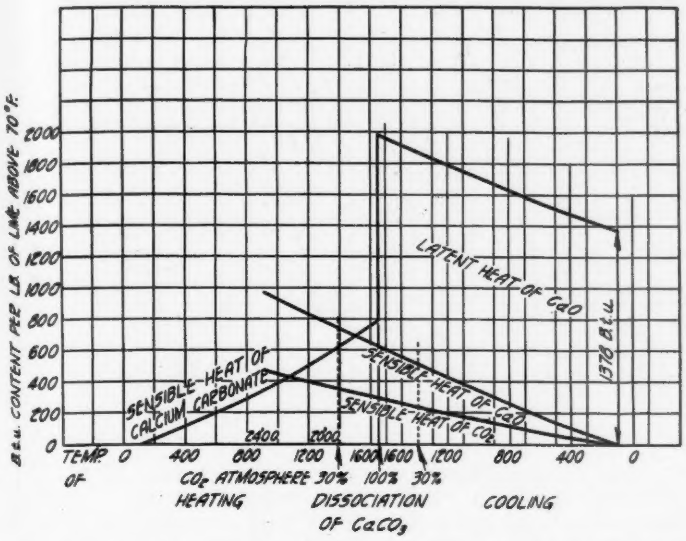


Fig. 58. Heat diagram showing amount of heat at different temperatures of stone, lime and gas equivalent to 1 lb. of CaO

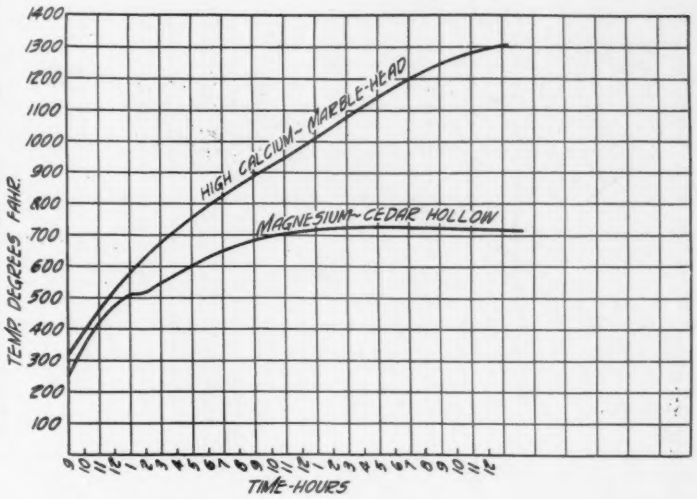


Fig. 60. Waste gas temperature rise, Marblehead and Cedar Hollow kilns

varies from 10 to 20 B.t.u. per square foot per hour per degree F., a difference great enough to be sensed in a decided manner in the practical every-day operation of the plant, and great enough to be taken account of by the kiln designer. Conductivity, in the main, is dependent upon porosity.

A lime kiln is a heat transfer apparatus. The limestone has first to be dried, then preheated up to the temperature of dissociation. Fig. 58 shows graphically how the heat content increases as the temperature rises. Each pound of carbonate will absorb around 800 B.t.u. before disassociation into CO_2 gas and calcium oxide begins forming. Now this preheating must be orderly. The coolest stone in the upper kiln portions should be in contact with the coolest portion of the up-flowing gas stream. Any irregularity here will upset the performance of the kiln.

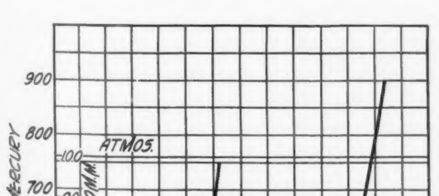


Fig. 59. Dissociation temperatures of calcium and magnesium carbonate

Heat Distribution

As the temperature of dissociation is reached, which, in a 100% CO_2 atmosphere, such as exists within a lime lump, is 1648 B.t.u., a sudden large demand for heat occurs as shown by the diagram. When the dissociation is complete, the heat is distributed into:

(1) Sensible heat of carbon dioxide gas passing up the kiln,

(2) Sensible heat of calcium oxide, and

(3) Latent heat in the calcium oxide.

After the dissociation is complete, the lime and the gas may be heated to 2400 deg. F. and possibly even more. The diagram shows plainly the heat content at any temperature. For example, at 2400 deg. F. the sensible heat content of 1 lb. of CaO is 350 B.t.u.

If the gas and the lime while in the kiln could be cooled down to the same temperature as the air and the stone entering the kiln, then only the latent heat of dissociation would remain. This, at atmospheric temperature, is 1378 B.t.u. per pound of CaO. This figure is very important, as it is the base of all efficiency calculations when high calcium lime is involved. Assuming we had a coal of 13,780 B.t.u. heat content per pound, then if the kiln were 100% efficient we should get a ratio of $\frac{13,780}{1378} = 10$ lb. of lime per pound of coal. If the ratio is 5 to 1, efficiency is only 50%, etc. This, of course, serves as an example only for $CaCO_3$; $MgCO_3$ requires less heat, as can be found from Physical Properties table.

If lime is drawn or gases escape hot and their temperature is determined, then with the help of the diagram the heat loss can readily be determined. So it can be seen that the diagram has great practical value, although unfortunately at higher temperatures it may be somewhat lacking in accuracy, due to deficiency or doubtfulness of the available scientific data.

Heat Required for Dissociation

Fig. 59 presents graphically the temperatures at which CO_2 parts from CaO. It will be noted that the lower the amount of CO_2 in the film in immediate contact with the limestone the lower is the temperature required. This means that since the kiln atmosphere contains around 30% CO_2, dissociation will take place at about 1520 deg. F. This, however, only on the surface; inside of a lump the atmosphere will be 100% CO_2, so the dissociation pressure will be 1648 deg. F. If, however, the stone is very dense, CO_2 will escape with difficulty and the minimum temperature necessary will be even higher. All of these temperatures are for sea level; high up in the mountains they would be lower.

If there is magnesium carbonate in the limestone its dissociation will begin at temperatures two hundred degrees lower, which means much higher up in the kiln. No one should ever compare the performance of a plant burning dolomite with one burning high calcium lime. The dolomite kiln performance, when the ratio is 4 to 1, is poorer than that of a high calcium kiln with a ratio of 3¼ lb. of lime per pound of coal. The reason is that magnesium carbonate requires a lower temperature as well as less heat. It is almost impossible to get very high temperatures on top of a dolomite kiln. I inserted thermocouples into the tops of a high calcium kiln and of a dolomite kiln and told the crew not to charge for a complete day, or until the temperature got as high as it would go. Fig. 60 shows this plainly, although the comparison is not very scientific, since the kilns were not of the same size nor were they operated at the same rate. The reasons for all this will be better shown in the following series of charts.

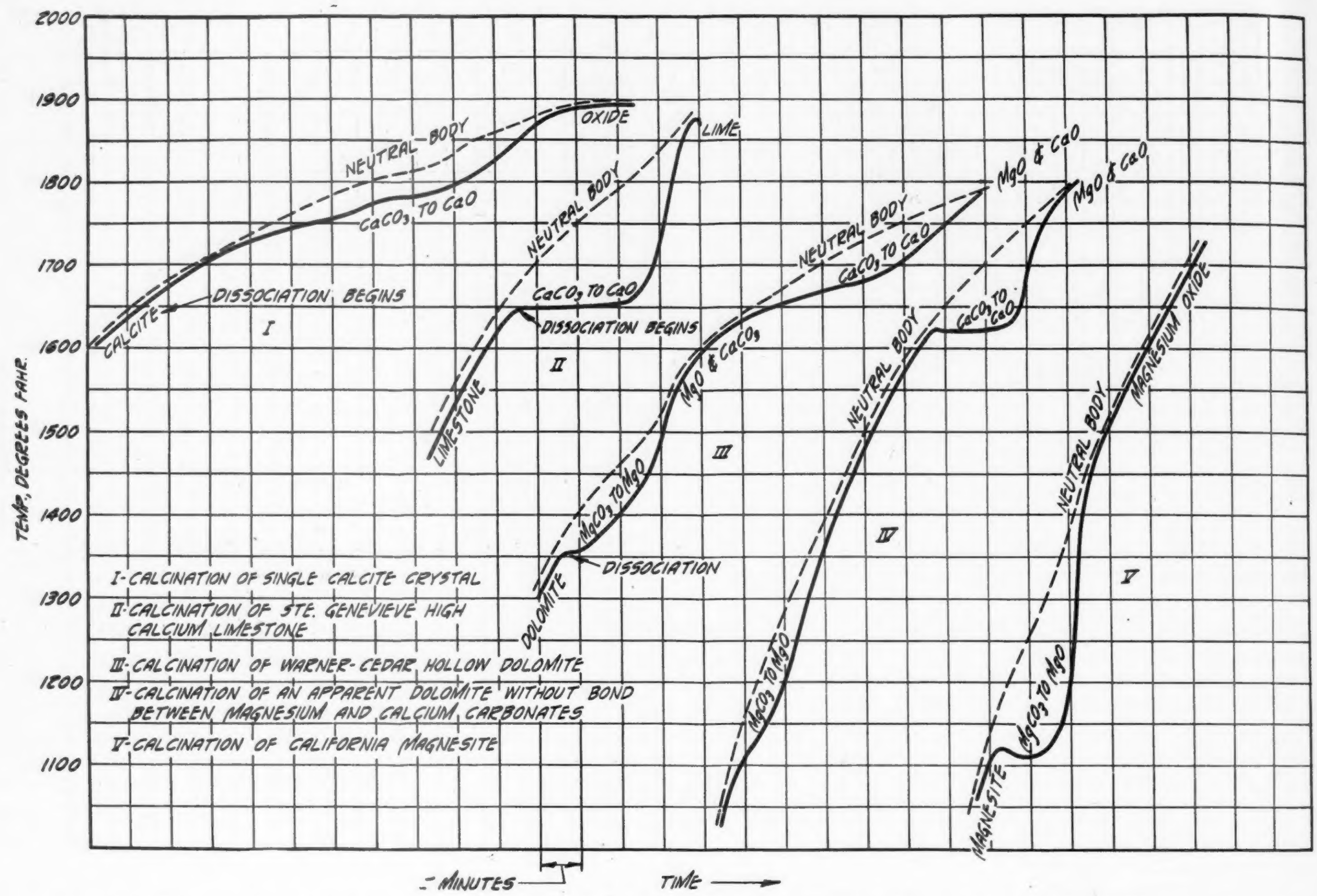


Fig. 61. Dissociation of calcium and magnesium carbonates. Time-temperature heating curves for various limestones (100% CO_2 atmosphere)

Charts Explained

Fig. 61 shows a line of Time-Temperature curves for various kinds of limestone. To obtain these from the respective stone a small average specimen was sawed to the desired shape, then a hole drilled into the exact center and into this hole a very fine wire thermocouple was embedded. The same was done with a material that was neutral; that is, one that underwent no chemical change within the temperature range the limestone was to be heated. The two samples were then inserted in an electric furnace surrounded with the desired atmosphere, and the electric current turned on. Every minute the temperature of the specimen was determined by means of a potentiometer and the results plotted. A series for 100% CO_2 atmosphere is given in Fig. 61. Commenting on these:

First is a calcite crystal, pure calcium carbonate, but very dense and with cells all in a very orderly arrangement. It can be seen that this sample gave up its carbon dioxide with considerable resistance. It took a much longer time and required a higher average temperature than any of the others.

Second is a specimen of the very pure Ste. Genevieve oolitic limestone, chemically of the same composition as the calcite but more porous and more irregular in the fine structure. The sample was burned in less than half the time and at a lower average temperature than the calcite.

Third is a solid specimen of Warner Cedar Hollow (Penn.) dolomite. The breaking of the bond between calcium carbonate and magnesium carbonate and the part of the carbon dioxide from magnesium carbonate takes place at much lower temperatures which, as said before, is equivalent to a much higher position in the kiln. This is extremely important to know, if one is to evaluate lime plant performance.

Fourth, specimen of so-called dolomite parts with its CO_2 in the magnesium carbonate at still lower temperature. This means that in this stone the calcium and magnesium carbonate may not be exactly the same as in the previous. There is no physical bond between the two which need be broken and so the calcination of one of its components begins even higher up in the kiln.

Fifth, specimen is a sample of California magnesite. Its dissociation takes place at comparatively low temperature; there being no calcium carbonate in the sample there is no upper deflection from the neutral body.

Experiments With Ste. Genevieve Stone

As mentioned, the dissociation of all the specimens in Fig. 61 took place in 100% CO_2 atmosphere. Fig. 62 shows four dissociation curves of Ste. Genevieve oolitic limestone, but with the atmosphere surrounding the specimens different in each case.

First is a specimen burned in 100% CO_2 presented here again for comparison.

Second is a specimen burned in 32% CO_2 atmosphere. It will be noted that dissociation begins at much lower temperature, the CO_2 pressure against the CO_2 in the carbonate being less. This condition applies particularly to the lime kiln in which, in the upper portions, the atmosphere is about 32 deg. F. and so dissociation begins at about the temperature shown.

The *third* specimen was also surrounded by an atmosphere containing 32% CO_2, but while in the second it was CO_2 and air, in this case it was CO_2 and superheated steam and no air. If steam would be as helpful to the making of lime as some contend it certainly ought to be shown here, but it is not. There is little difference in the nature of the second and third diagrams, although the atmosphere was 68% steam.

The *fourth* specimen was burned in dry air, with no CO_2 except such as the specimen gave off; even this was swept away by the rapid stream of air that was purposely maintained. The dissociation began, as it is to be expected, at lower temperature than either of the previous, but otherwise there

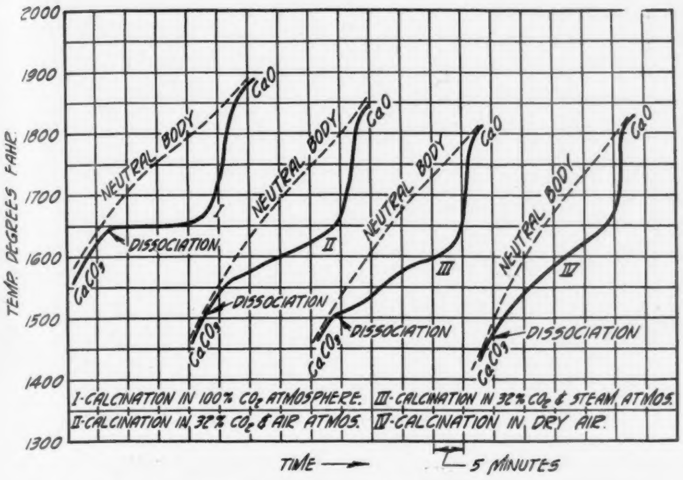


Fig. 62. Dissociation of calcium carbonate, time-temperature heating curves of Ste. Genevieve limestone in various atmospheres

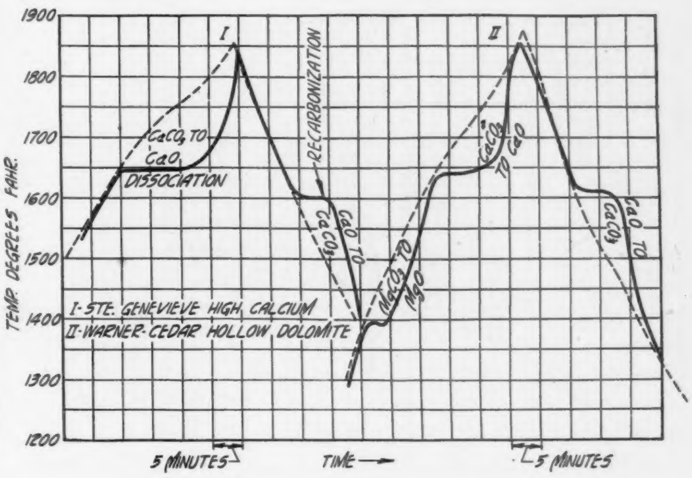


Fig. 63. Dissociation and recarbonization of limestone, (I) Ste. Genevieve high calcium, (II) Warner Cedar Hollow dolomite

was little gain since the lower concentration existed only on the outside and not to any great extent on the inside of the specimen.

Lime Recarbonates

At certain points, slightly below the dissociation temperature, calcium oxide will eagerly absorb carbon dioxide gas from the surrounding air. Let the gases from the burning zone penetrate down into the cooler and some lime will be immediately recarbonated. Fig. 63 shows this for a sample of high calcium stone and for a sample of dolomite. As the oxide is cooled a point is reached where the cooling is retarded, or it almost stops. As heat is required to drive the CO_2 gas from the carbonate, so heat is given off when the CO_2 is reabsorbed by the oxide; therefore during the upgrade there is a lag in the heating curve, during downgrade a lag in the cooling curve.

Only calcium oxide recarbonates. Many trials were made to recarbonate magnesium oxide, but never with success. Even when magnesium oxide heating was stopped short of 1500 deg. F., at which temperature it certainly should not have been overburned, still no deflection was noted in the cooling curve.

Use of Heating and Cooling Curves

These heating and cooling curves have a great practical value. They give one an idea of what is going on in the upper kiln portions. Indirectly they show what efficiency one may expect, and also what is likely to go on, in the lower kiln portions, if the cooler is not so designed that a stream of air can continually pass upwards into the burning zone. Then also, these curves reveal how a limestone is likely to behave in a kiln.

An engineer may apply an indicator to an engine and from the diagram that this indicator draws in the space of a fraction of a minute, or even second, he can derive a surprisingly large amount of information. He can tell when admission of steam takes place, when the cut-off occurs, when the exhaust valve opens and closes, when the compression starts, etc. He can tell if the valves are set right or not and what power the engine is developing.

Fig. 64 is a diagram that can tell almost as much about something altogether different. Calcite and oolitic limestone specimens were heated together. The shapes of the heating and cooling curves, the lengths of time, in fact, every deviation means something. It is possible to tell the comparative rates of heat transfer and of calcination, as, for example, calcite required 37½ minutes, limestone only 20½ minutes, although chemically both are exactly the same thing. Between these two stones enter others of different nature whose characteristics can be interpreted with exactness when tested simultaneously, with a specimen of known performance in an apparatus of proper design.

Hydrate Charts

Before we leave this subject of Time-Temperature diagrams, I would like to deviate from the subject of lime kilns with Fig. 65, which presents four diagrams for hydrated lime. If we heat hydrated lime at a certain temperature water leaves it.

First diagram shows this to occur at 825 deg. F., the sample being surrounded with air.

Second test was made while steam was passed through the furnace, so dehydration took place at 975 deg. F.

Third test was one in which CO_2 was passed through the furnace and as quickly as the hydrate gave up its water it absorbed CO_2, so while at the beginning it was hydrate at the end it was carbonate.

Fourth test was again with a steam filled furnace. On the heating upgrade the water parted from the oxide; on the cooling down-

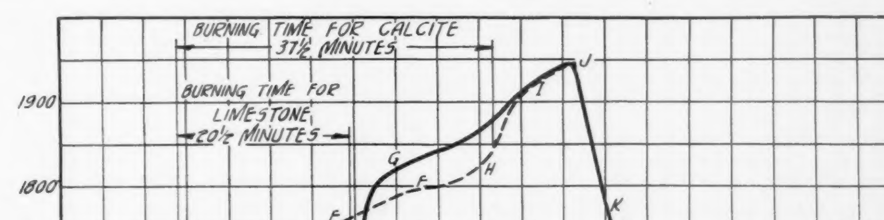


Fig. 64. Time-temperature diagram for crystal of calcite and specimen of oolitic limestone showing comparative rate of dissociation and recarbonization

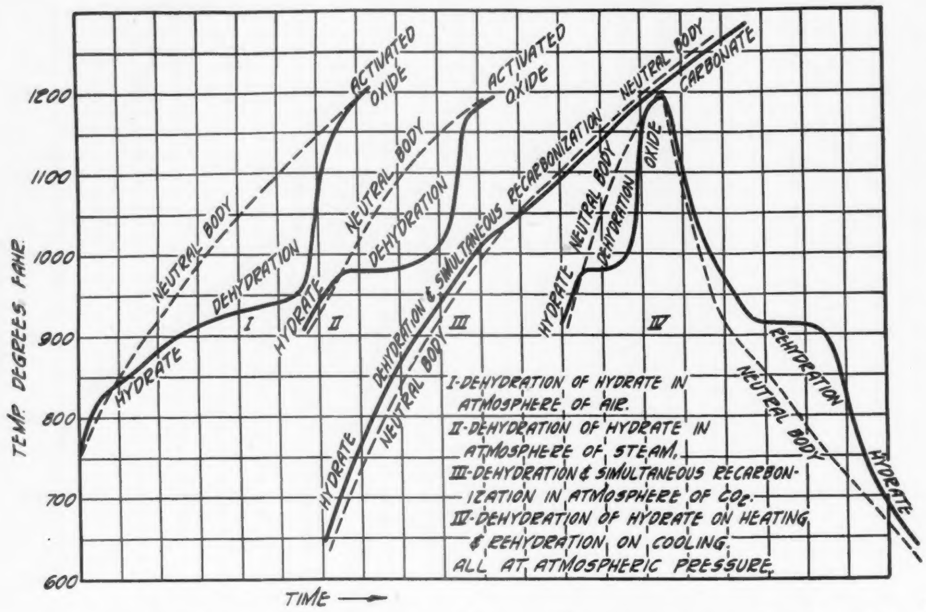


Fig. 65. Hydration and dehydration of lime. Time-temperature heating and cooling curves for hydrated lime

grade the oxide was rehydrated. So while in all cases the start was made with hydrate, two of the experiments were finished with oxide in the furnace, one with carbonate and the last with hydrate.

Other Properties Shown in Charts

The many Time-Temperature diagrams here presented picture only the effect of heat on limestone so far as dissociation is concerned, that is, the dissociation temperature level and dissociation readiness. Now there are other changes, in fact, many of them, some very subtle, but all affecting the lime or the kiln performance in one way or another. Fig. 66 pictures the effect of burning time and burning temperature upon the density of the lime. Very soft burned lime will occupy practically the same space as the limestone, so it will be very light, relative to its volume. On the other hand, very hard burned lime will shrink and may be over twice as heavy and with properties quite different.

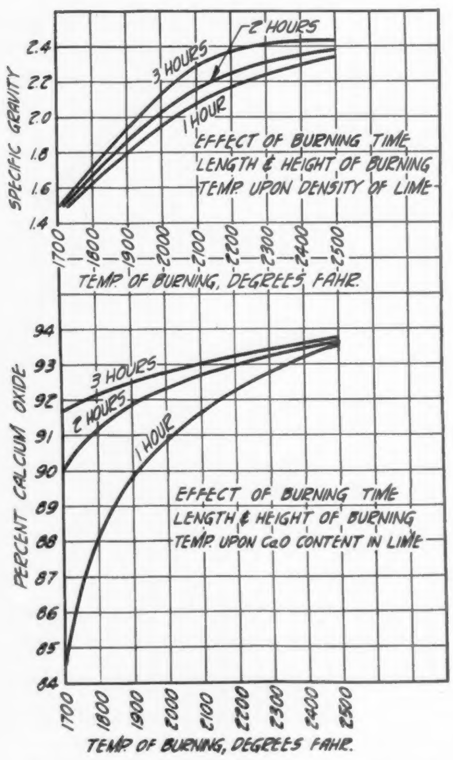


Fig. 66. Effect of burning time, length and height of burning temperature upon density and CaO content of lime

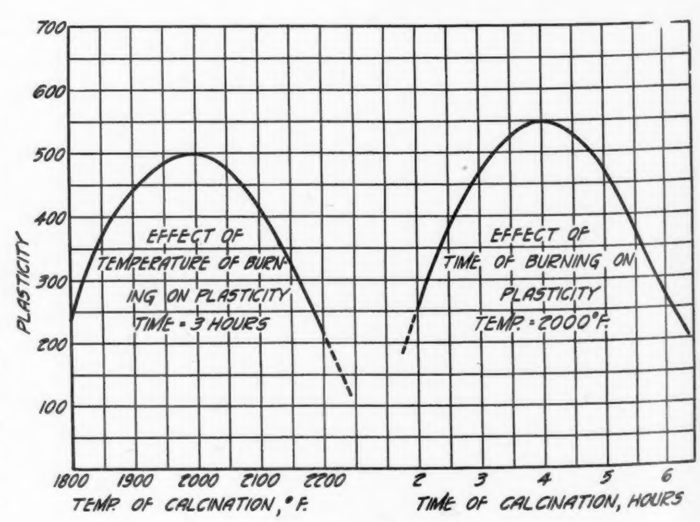
The lower part of Fig. 66 shows the relation of burning time and temperature to CaO content in lime; and putting the upper and lower set of curves together, many interesting deductions can be made, as, for example, that hardness of burn indicated by specific gravity depends more on temperature than on time: that very high CaO lime, suitable for carbide plants, is hard burned lime, burned at temperatures of 2400-2600 deg. F.; that soft burned lime in somewhat lower in CaO, burned for long periods at temperatures of around 2000 deg. F. This lime hydrates faster, is more reactive in solution, is of higher availability and higher plasticity.

However, in talking about this, we must not forget that lime can be burned for a very short time at high temperatures or for a very long time at low temperatures. We also must not forget the cooling effect of the core, for as long as there is core in the lump, lime just cannot be much overburned. So curves as these in Fig. 66 developed in the laboratory do not altogether apply in the field. Nevertheless, they are valuable indicators, particularly since the properties of lime burned to a certain specific gravity should be very close to the same, whether burned in a chemist's furnace or in a large kiln. It is surprising that greater use is not made of the indications one would derive from determining "specific gravity." In sintering plants where dolomite is dead-burned for refractory purposes, specific gravity is the indicator of the intensity of the burn that the product underwent.

Plasticity—Settling

The effect of temperature and time of burning on just one property "plasticity" is shown in Fig. 67. This was determined by Haslam and Herman of the Massachusetts Institute of Technology. The same limestone burned at two different temperatures or two different time lengths behaves as if it originated from two entirely different sources.

Fig. 68 shows the further effect of heat on lime properties. Lime was burned for different time lengths and at different temperatures with resulting startling differences in rate of settling, volume in water, rate of hydration and availability. That this occurs is not surprising; the explanation lies in the fine structure. In the third part of this series, Fig. 52 showed the unit cells of $CaCO_3$ and CaO, the bricks, so to speak, of which the masses charged into the kiln or drawn from the kiln are made up. Fig. 69 here presented goes into this farther. It consists of three figures representing limestone- and lime-cell aggregations. All lime in any form consists of infinitely small submicroscopic cells. In the case of limestone, Fig. A, they are closely packed. The edges of one are under the atomic influence of its neighbor. Specific gravity is quite constant, the difference is very little between the



R. T. Haslam and E. C. Herman

Fig. 67. Plasticity of Ohio lime versus time or temperature of burning

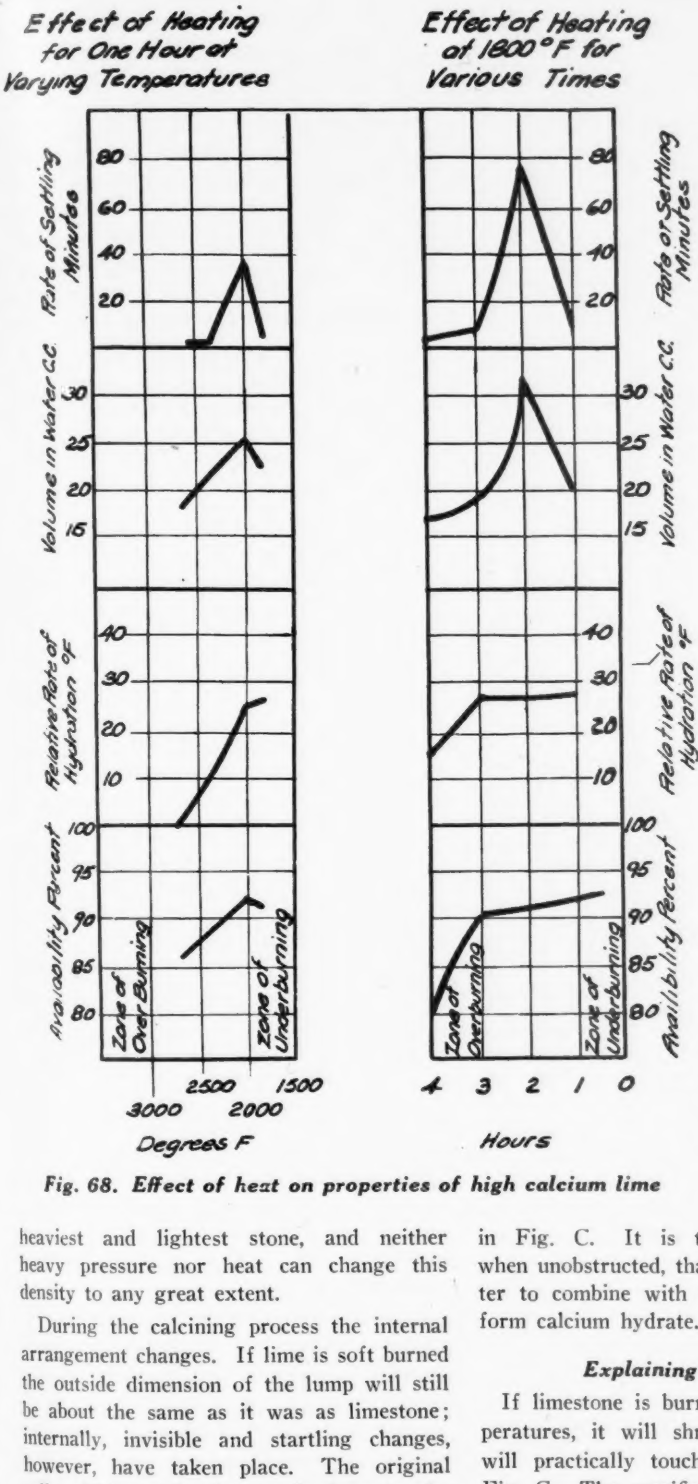


Fig. 68. Effect of heat on properties of high calcium lime

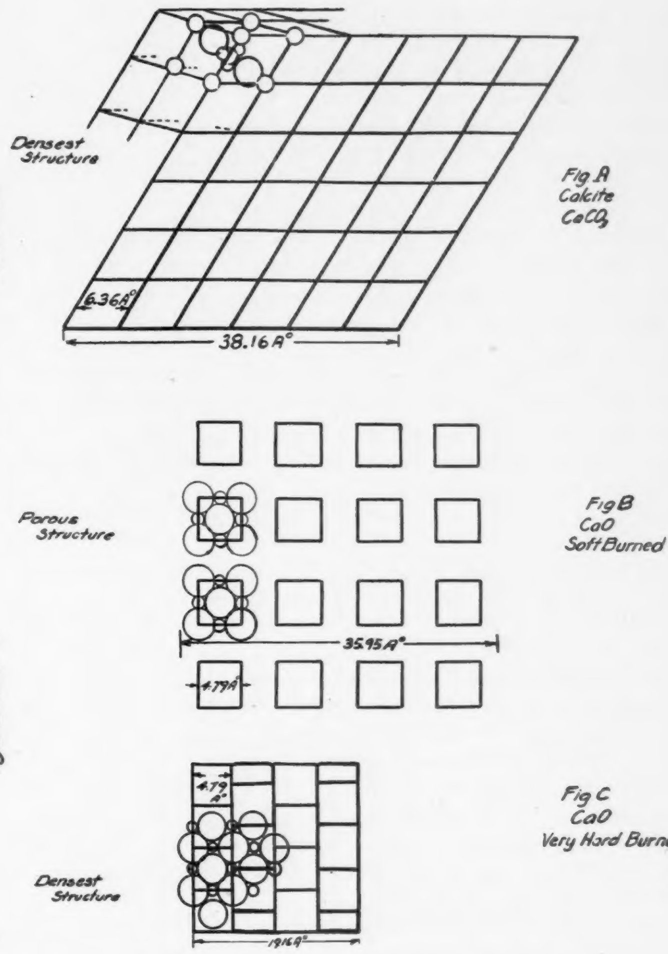


Fig. 69. Representation of limestone cells

heaviest and lightest stone, and neither heavy pressure nor heat can change this density to any great extent.

During the calcining process the internal arrangement changes. If lime is soft burned the outside dimension of the lump will still be about the same as it was as limestone; internally, invisible and startling changes, however, have taken place. The original cells which previously contained two molecules now contain four and over and above this the packing of atoms in the cells is so dense that each cell is smaller by a considerable amount and is much heavier. All of this can, of course, mean only one thing, that empty spaces are created between the cells as shown by Fig. B.

Higher and lower burning temperatures, as well as time of burning, have quite an effect on lime; outside entirely of the combinations that may take place with impurities at higher temperatures. If lime is soft burned, there will be little shrinkage of the lump and the specific gravity will be only 1.7. Since we know, however, that calcium oxide has a specific gravity of 3.4, evidently empty spaces not under atomic influence of the cell must have occurred somewhat as shown in Fig. C. It is through these spaces, when unobstructed, that water molecules enter to combine with calcium oxide and to form calcium hydrate.

Explaining Shrinkage

If limestone is burned at very high temperatures, it will shrink so that the cells will practically touch. This is shown by Fig. C. The specific gravity now will be, instead of 1.7, as high as 3.4, and all the spaces will be eliminated. The lime will be dead burned, quite inactive, very slowly hydrating, the settling rate will be very fast, the percentage of residue will be high; and the reason for all this is the elimination of the spaces which prevent access of water. There was no change in the lime cells themselves; they are as perfect as they are when lime is soft burned, but they are occluded, surrounded by a wall so to speak.

Fortunately the intracellular spaces are considerably larger than the water molecules, so there can be a great deal of shrinkage without seriously affecting the action of the lime. Still, under kiln condition often existing, considerable damage is done to lime either by too high temperature or by keeping the lime in the kiln too long after it is burned.

While elimination of spaces quite clearly explains the behavior of hard burned lime, why should soft burned lime behave the same? Certainly since there was no shrinkage, the spaces should exist and water should be able to enter and combine with the oxide to form hydrate, and this hydrate being very much bulkier, should break up and disintegrate the lump. Unfortunately, limestones do not all burn at the same temperature. At the surface, yes, but internally often the CO_2 generated is occluded and cannot escape except it builds up pressure, and under this higher pressure the decomposition temperature is higher. So one may well say that certain crystals may burn much faster than others.

If a piece of lime is burned just enough to make it appear that it is completely burned, without any visible indication of core, this lime may still contain some carbon dioxide; that is, certain crystals of limestone are still present unburned. The amount of $CaCO_3$ present may be comparatively small, say, 3%, still the carbonate represented by this CO_2 is bulky and often so located that it closes off the passages through

which water enters into the lump of lime, and as a result somewhat the same thing occurs as when the lime was overburned. The comparatively small amount of carbonate made a much greater amount of oxide unavailable and so availability was low. This explains why soft burned lime may act the same in some respects as hard burned and the reason for both is the same.

If lime contains impurities and is burned at too high temperatures, or for too long at lower temperatures, a combination takes place between the silica or alumina and the lime and a substance is formed somewhat as a glaze that is little affected by water. The calcium oxide that entered the combination becomes unavailable, and further this new compound that was formed obstructs the free flow of water into the intracellular space of the quicklime, and so some portion of uncombined CaO fails to slake in the space of time it has available.

Hydraulic Limes

The combination of lime with silica, alumina and iron to form the various silicates, aluminates and ferrates should, however, not be altogether condemned, as for certain purposes these compounds, when formed and used under proper conditions, give the lime some of the properties of cement. Hydraulic limes made from impure limestones are sufficiently important to deserve more space than can be given them in this part of the series; later we likely shall make a careful study of them. They certainly should interest the lime manufacturers. To burn a stone of which half does not disappear through the kiln stack, which gives fuel ratios and kiln capacity undreamed of with pure lime and a mortar of rapid hardening qualities and high in tensile and compressive strengths should interest him, as it may be one of the props to steady the shaky structure of his industry.

Soil Amendments—Including Sand

FOLLOWING IS AN abstract of that part of a recent radio talk by C. C. Fletcher, United States Bureau of Chemistry and Soils, and published in the *American Fertilizer,* of interest to our industry:

The term soil amendment means any material, other than commercial fertilizers, which may be used to improve or maintain soil fertility.

To get the best results from commercial fertilizers the soil must be in good mechanical condition and for many crops it must not be too acid. This condition as a rule may best be reached by providing adequate drainage, by the use of lime and by the addition of organic matter to the soil.

There are several forms of lime, all good. Limestone or shells may be finely ground or pulverized and used in this form. They may be burned in a kiln and turned into quick or burned lime. Ground limestone is often the cheapest form, burned lime is the most concentrated and hydrated lime, which is put up in 50-lb. paper bags, is often the most convenient for the small gardener.

The Use of Lime

If a soil is in poor mechanical condition, is strongly acid, or trouble is experienced in growing clover or alfalfa, the use of lime on the soil should always be considered.

Applications of burned lime recommended are usually from ½ ton per acre upwards, or 1 ton or more of ground limestone. The present tendency is to use light applications of lime at more frequent intervals rather than large amounts at longer intervals.

The small city gardener on heavy clay soils has a means of improving the mechanical condition of the soil permanently, which is too seldom tried. He can use sifted coal ashes or buy ordinary building sand at a low cost from sand and gravel companies and often a few tons of sand will transform his heavy clay garden to a beautiful sandy loam, which is easy to work, dries out more quickly after a rain and on which gardening is a pleasure rather than a task. The sand contains very little plant food, but this lack can easily be supplied by commercial fertilizers. This offers a market to sand producers now practically undeveloped.

Suspended Crusher Replaces Rolls

IN A RECENT TEST the efficiencies of hard-iron, or dirt rolls, and of the Newhouse suspended crusher were compared. The test was made on zinc-lead ore of the tri-state district, all of which was plus 1-in. square mesh, some pieces being as large as 4x6x10 in.

Two roll tests were made and the following conclusions were drawn from these test data: (1) crushing efficiency of the rolls decreased markedly as the wear increased from 17.3 to 30.5%; (2) crushing efficiency of the Newhouse crusher exceeded that of the rolls, even when the rolls were practically new.

Installation of a 7-in. Newhouse crusher was made following these tests with a guarantee by the manufacturers that hard-iron cost would not exceed 1 c. per ton of feed to the crusher; power consumption was not to exceed 0.96 hp. per ton per hour; capacity was to be at least 60 tons per hour with a 1-in. discharge opening. Continued tests after the installation showed a production of 68.2 tons per hour, or 13.2% more than guaranteed capacity, a hard-iron cost of 0.78 c. per ton of feed to the crusher, and power consumption of 0.62 hp. per ton of feed per hour.

These tests were made at the plant of the Commerce Mining and Royalty Co. and were reported by H. D. Keiser, assistant editor, *Engineering and Mining Journal.*

Six Reasons for Replacing Equipment Before It Is Worn Out

OBSOLESCENCE IN MOST PROCESS INDUSTRIES results from a combination of economic and technical considerations. Equipment is rarely replaced because of any physical deterioration such as the actual wearing out of existing apparatus. In the opinion of a well-informed chemical engineer in the petroleum industry, obsolescence is usually due to one of the following causes:

1. Existing equipment, although in good physical condition, may not produce the desired quality of products from the available raw materials.

2. The cost of ground space or other factors in the total operating cost may become excessive with existing equipment as compared with the possibilities offered by more recent developments.

3. An addition to plant capacity may be necessary, in which case it may be economic to replace some or all of the old equipment with a new installation of larger unit capacity.

Meeting Market Demands

4. Often a change in process requiring new equipment may offer flexibility which the older method did not have with the result that the manufacturer may better meet varying market demands for his products.

5. New equipment may offer the possibility of obtaining greater yields of more valuable products.

6. New equipment often permits the conversion of byproducts or waste materials into marketable commodities. Continued production of non-salable byproducts may necessitate more and more provision for storage within the plant or the disposal of the material at an absolute loss. In such cases the investment in new apparatus is sometimes warranted even though the process is not directly profitable as an independent operation.—*Chemical and Metallurgical Engineering.*

Limits of Inflammability of Gases and Vapors

A COMPREHENSIVE SURVEY of the limits of inflammability of gases and vapors is contained in Bulletin 279 of the U. S. Department of Commerce, Bureau of Mines, recently issued. This information has been arranged, coordinated and critically reviewed.

The investigation was started, it is said, as of fundamental importance in the study of mine explosions and their prevention. Many gases and vapors are discussed. The report may be of value to rock dust producers who wish to study the causes of explosions their material is used to prevent.

Researches on the Rotary Kiln in Cement Manufacture*

Part XX—Calculation of the Exit Temperatures of the Gases from a Perfect Rotary Kiln, Using Incoming Air Preheated to Different Temperatures by the Outgoing Clinker, No External or Internal Radiation Losses Occurring

By Geoffrey Martin

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ALTHOUGH a perfect rotary kiln is unattainable in practice, it is important to know the conditions which would prevail in a perfect kiln, as in that way we can ascertain how far the kilns actually in use fall short of the ideal, and what are the precise limits to possible improvement in any given particular.

We must now define what we mean by a *perfect rotary cement kiln.*

In such a kiln:

(*a*) No radiation losses will occur.

(*b*) All the heat is communicated to the raw material by conduction and convection of the hot gases produced in the kiln by the combustion of coal.

(*c*) The gas leaves the decarbonating zone at 1481 deg. F., and will be of the same temperature as the raw material all the way down the kiln, so that the interchange of heat between the gas and raw material is perfect.

(*d*) The slurry will be dry, no mechanically mixed water being present.

(*e*) The weight of air used per 1 lb. of standard coal (of 12,600 B.t.u. per lb.) is 10.478 lb., as shown in Part XI.

(*f*) The weight of the combustion gas produced per 1 lb. of standard coal will be 11.278 lb. and of the composition shown in Part XI.

(*g*) The maximum temperature to which the incoming air can be heated by the outgoing clinker is 2500 deg. F. (1371 deg. C.), which is taken as the clinkering temperature.

(*h*) The temperature of the external atmosphere is taken as 60 deg. F. (15.6 deg. C.).

With these premises we will now proceed to calculate the conditions regulating the temperature of the exit gas when the air is preheated to different temperatures by the outgoing clinker.

This can only be done by calculating a series of heat balances, taking the passage of the combustion gas right down the kiln from the hot end to the cold end. This we will now proceed to do.

Let us take the simplest case first, and suppose that the air entering the kiln is not being preheated at all by the outgoing clinker, as shown in Fig. 1.

Hence the 10.478 lb. of cold air at 60 deg. F. meet with 1 lb. of coal dust, which burns, and as no radiation losses of any kind occur, there are generated 11.278 lb. of combustion gas at a flame temperature of 3769 deg. F., as was explained in Parts XI, XIII and XV.

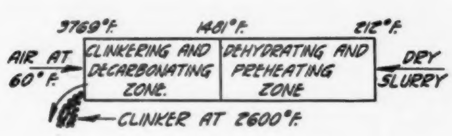


Fig. 1

This gas then travels through the clinkering and decarbonating zone of the kiln, and escapes from the latter at a temperature of 1481 deg. F., after having given up to the raw material in these zones 7972 B.t.u.

As shown in Part XV, these 7972 B.t.u. will produce in the clinkering zone $\frac{7972}{918.6} =$ 8.680 lb. of clinker.

As shown in Part XIX (see also Part X), this weight of clinker is produced from 13.543 lb. of dry slurry, and there is expelled therefrom 4.547 lb. of CO_2 at 1481 deg. F., also 0.2231 lb. of H_2O from the kaolin (at 1472 deg. F.), and 0.0937 lb. of H_2O from the hydrated silica (expelled at 752 deg. F.).

These hot gases now pass down the kiln and out of the decarbonating zone into the dehydrating and preheating zone, and finally escape at cold end of the kiln at an exit

TABLE I—SHOWING EXIT TEMPERATURE, ETC., OF GASES FROM A PERFECT ROTARY KILN WHEN 10.478 LB. OF AIR ARE USED PER 1 LB. OF STANDARD COAL BURNT, AND THE ENTERING AIR IS PREHEATED BY THE CLINKER TO THE TEMPERATURE SHOWN IN COLUMN (1)

(1) Temperature of entering combustion air (10.478 lb. per 1 lb. coal) Deg. F.	(2) Flame temperature Deg. F.	(3) Weight of clinker per 1 lb. of standard coal Lb.	(4) Tons of standard coal consumed per 100 tons clinker	(5) Per cent. of moisture in slurry	(6) Temperature of dry slurry entering kiln Deg. F.	(7) Temperature of exit gas Deg. F.	(8) Per cent. of total heat in clinker restored to kiln by entering air
60	3769	8.680	11.52	0	60	212	0.8
100	3794	8.785	11.38	0	60	212	1.8
200	3855	9.045	11.06	0	60	212	6.1
300	3916	9.311	10.74	0	60	212	10.2
400	3977	9.580	10.44	0	60	212	14.1
500	4038	9.850	10.15	0	60	212	17.8
600	4100	10.125	9.88	0	60	188	21.3
700	4160	10.397	9.62	0	60	167	24.7
800	4222	10.675	9.37	0	60	129	27.9
900	4282	10.954	9.13	0	60	105	31.0
1000	4344	11.239	8.90	0	60	745	34.0
1100	4405	11.463	8.724	0	77	60	36.8
1200	4465	11.546	8.6613	0	106	60	39.6
1300	4525	11.815	8.4638	0	134	60	42.2
1400	4586	11.990	8.3399	0	161	60	44.7
1500	4645	12.160	8.2238	0	187	60	47.1
1600	4706	12.332	8.1089	0	212	60	49.5
1900	4936	12.83	7.7923	0	282	60	56.0
2100	5071	13.160	7.5986	0	325	60	60.0
2300	5224	13.48	7.4214	0	365	60	63.6
2500	5370	13.79	7.2535	0	402	60	67.0

temperature T, which in this particular case is known by a preliminary calculation to be 212 deg. F. In passing down the kiln these gaseous products yield up their heat to the raw material, and the quantities of heat thus liberated may be calculated as follows:

(*a*) The heat evolved by 11.278 lb. of combustion gas sinking from 1481 deg. to 212 deg. F. is

$$11.278 \times 0.2610 \times (1481 - 212) = 3735.4 \text{ B.t.u.}$$

(*b*) The heat evolved by the 4.547 lb. of CO_2 evolved from the slurry sinking from 1481 deg. to 212 deg. F. is, from our heat tables:

$$4.547\ (360.911 - 37.483) = 1470.63 \text{ B.t.u.}$$

(*c*) The heat evolved by the 0.2231 lb. of H_2O vapor evolved from the kaolin at 1472 deg. F. and sinking to 212 deg. F. without condensing to liquid is, from our heat tables:

$$0.2231\ (691.779 - 84.256) = 135.54 \text{ B.t.u.}$$

(*d*) Heat evolved by the 0.0937 lb. of H_2O expelled from the hydrated silica at 752 deg. F. (400 deg. C.) and sinking from that temperature to 212 deg. F. without condensing to water will be

$$0.0937\ (336.257 - 84.256) = 23.61 \text{ B.t.u.}$$

(*e*) Heat evolved by x lb. of steam in the furnace gases condensing to liquid water at 212 deg. F., depositing on the cold dry slurry entering the kiln at 60 deg. F., and further cooling from 212 deg. to 60 deg. F. in contact with the slurry, is

$$x\ (970.7 + 212 - 69) = 1122.70\ x \text{ B.t.u.}$$

Now, obviously:

Heat evolved by furnace gases and steam passing down the kiln = heat absorbed in heating the 13.543 lb. of slurry from 60 deg. to 1481 deg. F. (the temperature at which the latter enters the decarbonating zone) = weight of clinker $\times$ 652.5 (see Part X) = 8.680 $\times$ 652.5 = 5663.7 B.t.u.

Hence we have the following equation:

$$3735.4 + 1470.63 + 165.54 + 23.61 + 1122.70x = 5663.7,$$

or $x = 0.266$ lb. of water.

Hence in this case the furnace gases pass away at 212 deg. F., carrying with them the bulk of the steam, but depositing 0.266 lb. of water on the cold incoming dry slurry, which it helps to preheat to 212 deg. F.

All the heat in the outgoing hot clinker is wasted, since none is supposed to be restored by the incoming air. Since the 8.680 lb. of clinker fall away from the kiln at 2500 deg. F. and finally cool to 60 deg. F., and since the mean specific heat of the clinker between 60 deg. and 2500 deg. F. is 0.2519, the amount of heat lost is

$$8.680 \times 0.2519 \times (2500 - 60) = 5335 \text{ B.t.u.}$$

Now let us consider the case when the incoming air is preheated by the outcoming clinker to 100 deg. F., all other circumstances being the same as above.

Then, as shown in Part XIII, Table III, the flame temperature of the 11.278 lb. of combustion gas will be 3794 deg. F., and the respective quantities of the various components formed in the kiln will be (see Part XV, Table I, and Part XIX, Table I):

Clinker	8.785 lb.
Dry slurry	13.707 lb.
CO_2 evolved from slurry at 1481 deg. F.	4.602 lb.
H_2O expelled from kaolin at 1472 deg. F.	0.2258 lb.
H_2O expelled from silica at 752 deg. F.	0.0949 lb.

On repeating the preceding calculation we arrive at the following result:

The furnace gases still pass away from the kiln at 212 deg. F., but more water, amounting to 0.3093 lb., is deposited on the dry entering slurry, leaving 0.4594 lb. of water to pass away as steam.

The 8.785 lb. of clinker produced in passing away from the kiln and falling in temperature from 2500 deg. to 60 deg. F. carry away with it

$$8.785 \times 0.2519 \times (2500 - 60) = 5400 \text{ Bt.u.}$$

The 10.478 lb. of entering air are supposed to be preheated to 100 deg. F. by this hot clinker, and so restore to the furnace 96.5 B.t.u., which amount to 1.8% of the heat in the clinker.

On repeating a succession of these calculations for air preheated to different amounts we get a series of results from which the accompanying Table I is compiled. On studying this table the following facts appear:

(1) When the entering 10.478 lb. of air per 1 lb. of coal are preheated by the issuing clinker from anything between 60 deg. and 500 deg. F., the exit temperature keeps steady at 212 deg. owing to the fact that the gases are condensing their steam, which separates first as boiling water, and serves to preheat the cold entering dry slurry.

(2) When the clinker preheats the entering air to a higher temperature than 500 deg. F., the temperature of the exit gases steadily decreases (all their water having been condensed) until, where the entering air attains a temperature of 1100 deg. F., the exit temperature of the gases falls to 60 deg. F. and the gases issue from the kiln at the temperature of the external atmosphere, having given up all their available heat to the entering raw material.

(3) When the entering air is preheated above 1100 deg. F., the heat from the hot gas is absorbed so completely in producing clinker that the 11.278 lb. of combustion gas produced per 1 lb. of coal do not contain heat to issue from the kiln even at 60 deg. F. So that in this case the entering dry slurry must be preheated to a temperature ranging from 77 deg. F. (when the entering air is at 1100 deg. F.) to a temperature as high as 402 deg. F. (when the entering air is at 2500 deg. F.).

In this connection see also Parts XVII and XIX, where the case is discussed in detail.

These conclusions at first sight seem contrary to common sense, since one would naturally expect that the higher the temperature at which the air enters the kiln, the higher will be the exit temperature of the emergent gases, whereas the exact contrary is the case, the *exit temperature of the gases steadily falling as the temperature of the entering air increases.*

The reason of this, however, will be apparent to anyone who calculates out a series of heat balances on the lines outlined above. The reason of the phenomenon is, of course, that clinker formation is a *high-temperature process and not a low-temperature process.* To make 1 lb. of clinker requires (see Part X) 918.6 B.t.u. absorbed *above* 1481 deg. F., but only 652.5 B.t.u. absorbed *below* 1481 deg. F.

Hence, if the heat in the entering gases is presented to the raw material in such a manner that there is a high percentage of available *high-grade heat*, this heat will be readily absorbed, with a resulting large output of clinker per 1 lb. of coal.

On the other hand, if the available heat in the gases contains a *large percentage of low-grade heat*, this heat is *useless* for forming clinker, and comes down the kiln unabsorbed and appears as heat in the *exit gases.* In this connection the reader should consult Part XVI again.

Now preheating the entering air to a high temperature simply means increasing the proportion of high-grade to low-grade heat in the entering gases and therefore the more complete absorption of the heat in clinker formation in the upper part of the kiln.

No heat whatever is absorbed in clinker formation unless it is presented at a temperature above 1481 *deg. F.* (805 *deg. C.*), *most heat simply passing unabsorbed down the kiln and appearing in the exit gases,* and is simply wasted except in so far as it preheats the raw material for the clinkering zone and evaporates superabundant water.

Hence the process, when followed thermodynamically, shows the appalling wastage of heat in the present method of employing gases containing such a large proportion of low-grade heat, as shown in Part XVI.

For fuel economy it is essential to utilize high-grade heat for high-grade thermal work and low-grade heat for low-grade thermal work, and therefore that the entering gases must be heated as highly as possible.

The present article, therefore, forms another proof of the statements set forth in Part XVI.

In the preceding sections the amount of air entering the kiln has been kept steady at the normal amount, viz., 10.478 lb. per 1 lb. of coal.

It has just been shown that when this is the case, and when the temperature of the entering air attains 1100 deg. F., the high-grade heat is absorbed so completely in forming clinker that the combustion gas does not contain sufficient heat to preheat the slurry to the temperature of the carbonating zone (1481 deg. F., or 805 deg. C.), and that

TABLE II—ALL HEAT RESTORED FROM CLINKER TO KILN BY THE AIR ENTERING PREHEATED TO THE TEMPERATURE SHOWN IN COLUMN (1) BY THE WEIGHT OF CLINKER SHOWN IN COLUMN (3). THE QUANTITY OF ENTERING AIR IS SUFFICIENT TO RESTORE TO THE KILN ALL HEAT OUTGOING IN THE CLINKER—10.478 LB. OF THIS HOT AIR ENTER WITH THE COAL DUST IN THE CLINKERING ZONE AND THE REST PASSES INDIRECTLY INTO THE PREHEATING ZONE

(1) Temperature of preheated air *T deg.*	(2) Flame temperature	(3) Weight of clinker per 1 lb. standard coal	(4) Tons standard coal per 100 tons clinker	(5) Temperature of dry slurry entering kiln	(6) Temperature of exit gases	(7) Percentage of heat in clinker restored to kiln by entering air	(8) Total weight of air per 1 lb. of coal	(9) Air used with 1 lb. of coal	(10) Air used for preheating slurry
Deg. F.	Deg. F.	Lb.		Deg. F.	Deg. F.		Lb.	Lb.	Lb.
1100	4405	11.522	8.6790	60	60	100	28.5	10.478	18.022
1200	4465	11.806	8.4703	60	60	100	34.1	10.478	23.622
1300	4525	12.094	8.2686	60	60	100	24.8	10.478	14.322
1400	4586	12.386	8.0736	60	60	100	23.5	10.478	13.022
1500	4645	12.675	7.8895	60	60	100	22.2	10.478	11.722
1600	4706	12.972	7.7089	60	60	100	21.2	10.478	10.722
1700	4805	13.271	7.5353	60	60	100	20.3	10.478	9.822
1800	4862	13.575	7.3665	60	60	100	19.5	10.478	9.022
1900	4936	13.873	7.2082	60	60	100	18.7	10.478	8.222
2000	4995	14.177	7.0537	60	60	100	18.1	10.478	7.622
2100	5071	14.485	6.9037	60	60	100	17.5	10.478	7.022
2200	5147	14.793	6.7599	60	60	100	17.0	10.478	6.522
2300	5224	15.102	6.6216	60	60	100	16.5	10.478	6.022
2400	5301	15.414	6.4876	60	60	100	16.1	10.478	5.622
2500	5370	15.732	6.3565	60	60	100	15.6	10.478	5.122

therefore the slurry must be separately preheated to various amounts in order to enable it to enter the decarbonating zone at the correct temperature.

As shown in Parts XVII and XVIII, this state of affairs can be remedied by allowing *more* than the 10.478 lb. of air to enter the kiln per 1 lb. of coal, provided that this air is preheated by the clinker so as to restore to the furnace all the heat outgoing in the clinker.

In the above table the effect is shown of dividing the air stream into two parts after the air has removed all the heat from the clinker; 10.478 lb. of hot air are allowed to enter the clinkering zone with the coal dust and burn them in the usual way. The balance of hot air is allowed to enter the preheating and dehydrating zone below the carbonating zone, and thus preheat the cold slurry to the necessary degree.

When these arrangements are made and the necessary calculations performed, the data in the table result.

The weight of air which must be supplied in order to remove all the heat from the clinker is calculated as follows:

The specific heat of the clinker between 60 deg. and 2500 deg. F. is 0.2519.

Let W = necessary weight of air.

Then

$$W \times \left\{\begin{matrix}\text{Mean specific heat}\\ \text{of air between}\\ T\text{ deg. and 60 deg.}\end{matrix}\right\} \times (T-60) = \left\{\begin{matrix}\text{weight of clinker}\\ \times 0.2519 \times\\ (2500\text{-}60)\end{matrix}\right.$$

Here T = temperature to which the air is preheated, shown in column (1) of the attached table.

The weight of clinker is obtained from column (3), and the mean specific heat of the air between the various temperatures is read off from our specific heat tables.

It will be seen from this table that under these conditions the kiln is working under a condition of maximum efficiency and all the heat supplied is consumed in the kiln itself.

So that the exit gases escape at 60 deg. F. —the temperature of the air— and the clinker escapes at 60 deg. F., while the kiln, under the most favorable conditions, can produce 15.732 *lb. of clinker for* 1 *lb. of standard coal burnt, or* 100 *tons of clinker per* 6.3565 *tons of standard coal.*

(To be continued)

Gypsum Production and Trade in Canada

CANADA RANKS third in world production of gypsum, says a report by vice consul Adam Beaumont as reported in *Commerce Reports.* In 1927 it produced about 9% of the world total, as compared with the United States, approximately 43%, and France, 22%. In that year it also furnished a trifle over 58% of the entire British Empire output.

Preliminary figures show that Canada produced 1,060,000 tons of gypsum in 1930, compared with 1,211,689 in 1929. The latest year for which separate statistics are available is 1928, when there was a total production of 1,205,846 tons for the entire Dominion—971,736 in Nova Scotia, 85,811 in Ontario, 74,783 in New Brunswick, 51,285 in Manitoba, and 22,231 in British Columbia. This entire output consisted of 995,297 tons of crushed gypsum, 176,411 calcined, 24,589 lump, and 9,549 fine ground.

The greater part of the Canadian output is exported to the United States as crude rock, but the exports of gypsum plasters and other gypsum products are increasing gradually.

On account of the large deposits of gypsum of excellent grade in Canada, which are easily accessible to transportation and cheaply quarried, the export markets for crude rock always have been of great importance. Extension of this market, however, depends entirely upon the requirements of mills in eastern United States.

Exports of calcined gypsum and gypsum products are subject to entirely different conditions. A small but gradually increasing export trade in finished gypsum products has been caried on by Canadian firms for a number of years.

Important gypsum deposits near Hamilton, Ont., are mined by a company which in recent years has undertaken a program of expansion involving acquisition of numerous allied businesses. It has gypsum-manufacturing plants in Quebec, Ontario, Manitoba and British Columbia. Its lime plants are operated at several points in Ontario and Quebec, with quarries adjacent to the plants, and there is an alabastine manufacturing plant in Ontario. The company also owns plants in Toronto and Montreal, manufacturing sand-lime products.

Imports of gypsum and its products into Canada slightly increased between 1924 and 1928, but the importation of 43,071 tons, valued at $268,103, in 1912 still remains the highest on record. While crude gypsum is admitted free, there is an import duty of $0.125 per 100 lb. gross on calcined gypsum and of 15% ad valorem on ground gypsum not calcined.

There appear to be good prospects for expansion of the Canadian gypsum industry. Its financing is sound, its equipment modern.

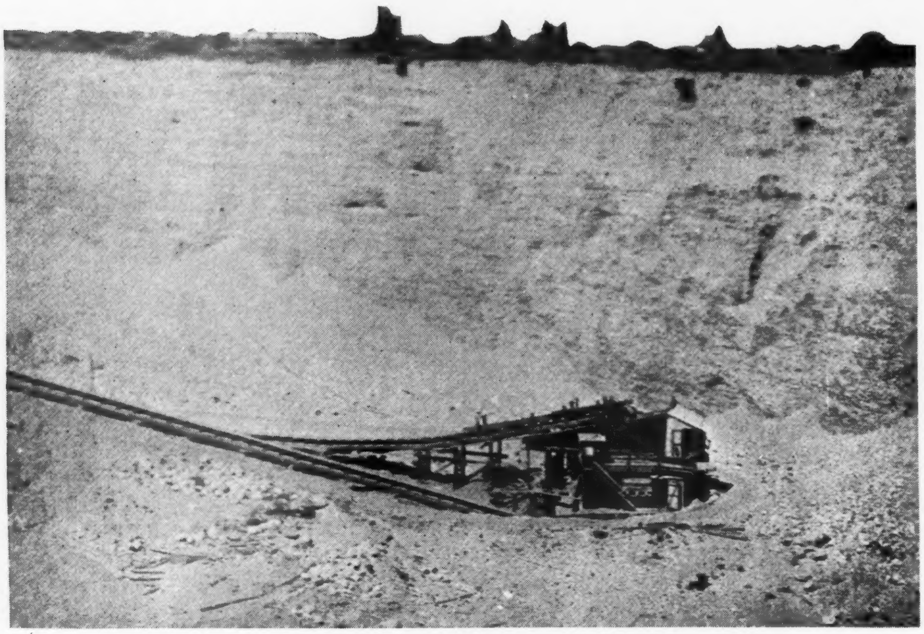
New German Fertilizer

A NEW MIXED fertilizer has appeared on the German market under the name of "Scheibler's Kalkammon Phosphat," says the *American Fertilizer.* This fertilizer consists of lime, ammonia, and a phosphate. Two grades are manufactured, grade I containing 7% nitrogen and 17% phosphoric acid, and grade II, 12% nitrogen and 12% phosphoric acid.

Designing for Unusual Conditions

At the Irwindale Plant of the Consolidated Rock Products Co., Los Angeles, California

By Edmund Shaw
Contributing Editor, Rock Products



Primary crushing plant in pit, with field belt and plant belt

THE IRWINDALE PLANT of the Consolidated Rock Products Co., Los Angeles, Calif., was completed early in 1928. Rather strangely, this is the first complete description of it that has been published, for it is one of the best designed and built gravel plants in the United States in my estimation. Indeed I find it hard to think of one that is better adapted to its particular conditions. It is "strung out" somewhat more than I would wish a plant to be if I had to superintend its operation, but this is characteristic of many modern plants in which belt conveyors take the place of elevators in every department.

The designer was Walter Saxe, an engineer with the Conveyor Co., Los Angeles. This company furnished the conveying and screening machinery for the plant, except as stated otherwise in the description that follows:

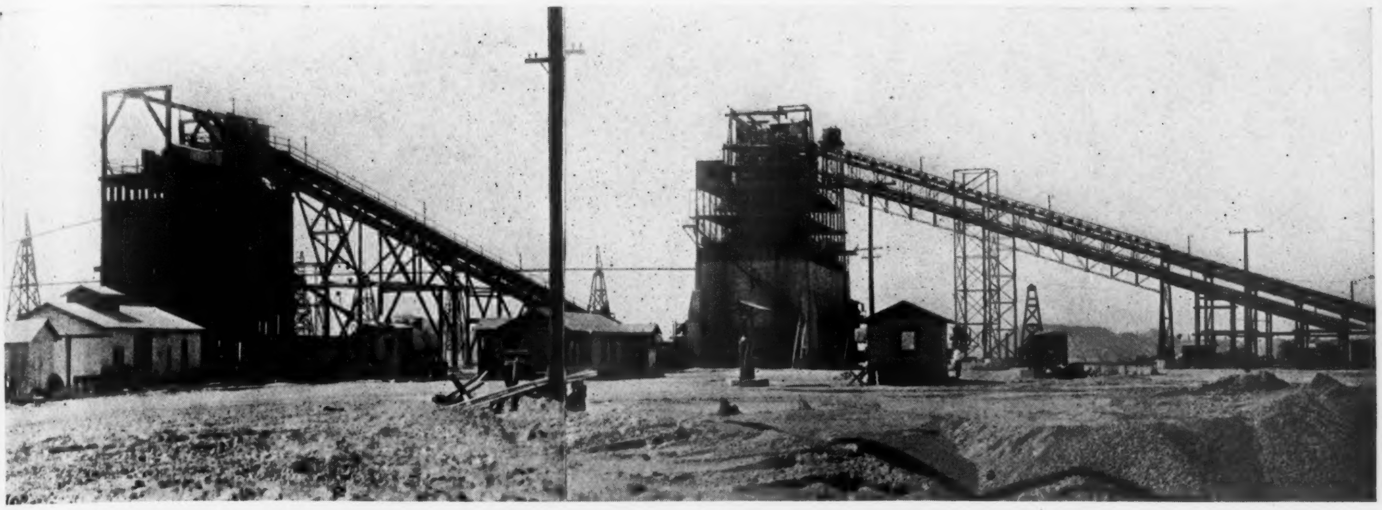
The plant is situated in the San Gabriel wash about 30 miles out of Los Angeles, near Azusa. Some of the largest plants on the West Coast are near it, the Baldwin Park plant of Consolidated Rock Products Co., and the former Reliance Rock Co.'s plant, which now belongs to the Consolidated. Both have capacities for outputs of 500 to 600 tons per hour and both have been described in previous issues of ROCK PRODUCTS.

High Percentage of Rock and Gravel

The San Gabriel wash at the Irwindale plant site contains one of the best deposits in the state from a producer's viewpoint. The proportion of crushed rock and gravel in the finished product is about right to sell with the sand produced, which is a little unusual in this part of the country where pea gravel and sand are wasted at many plants. Some sand has to be wasted at the Irwindale plant, too, but it is largely the unwanted fine sand thrown off by the

View of pit from top of washing plant

Storage tracks and stock piles



Panoramic view of proportioning plant, office and washing plant

classifiers. Boulders for crushing to "No. 4" material for making bituminous road bases are desirable at the present time in the Los Angeles district, and this deposit has rather more of them than some others in the locality. The photographs of the bank show how evenly they are distributed from the top to the bottom of the pit walls.

It is surprising the way the high banks stand in this and neighboring deposits. In starting a cut all that the shovel has to do is to undercut the bank about two feet. Then the material begins to fall and comes down about as fast as the shovel can handle it easily. One view shows the shovel working in front of a little cave that came from running into a soft spot where the ground was unusually moist. Ordinarily the banks stand as they are shown in the other pictures.

Gravel Deposits 400 Ft. Deep

In the same wash the Consolidated has another plant that is served with a scraper bucket excavator. At this point it is necessary to put in a few shots occasionally to shake up the ground and make it easier digging for the scraper bucket. This is never needed with the steam shovel, and the writer has never seen any hard cemented gravel in any of the plants that he has visited although it is all well compacted.

The pit is about 100 ft. deep at present. The writer has been told by what seemed good authority that drillings in the San Gabriel wash have shown practically the same sort of material to continue for more than 400 ft. below the surface. Of course, there is a water level above this and water shows in the pit of the Consolidated's Durban plant which is in the same wash. But it will be many a year before such a deposit is exhausted and the building of such a permanent and well equipped plant was fully justified by the amount of material that was in sight.

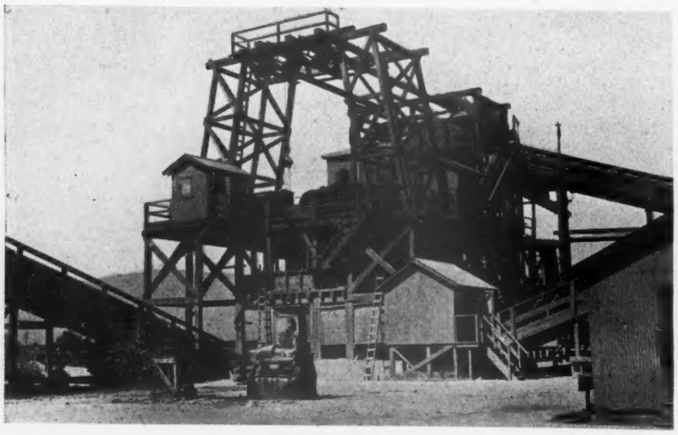
The pit is worked by a Bucyrus No. 80-B electric shovel with a 2½-yd. dipper. It dumps into a 50-ton hopper which is over the end of a 42-in. belt conveyor. The steel frame on which this belt conveyor rests is in 20-ft. sections and enough of these are in use to make it 640 ft. long center to center at the present time. It is driven by a single motor at one end, which is somewhat unusual for so long a belt, and this speaks well for the stability and alignment of sectionalized frame work.

Why Field Conveyor Is Preferred

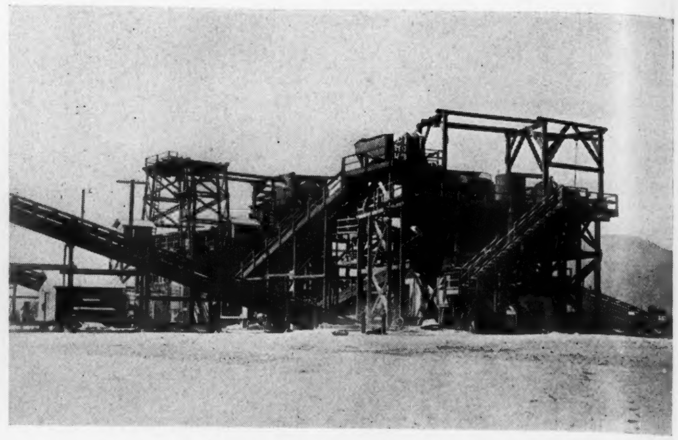
In the same locality, and working on practically the same material, the company has pits in which dump cars and dinkeys are used and one in which the material is taken from the shovel in the pit to the primary crusher on the ground level in cars that are pulled up an inclined track by a double-drum hoist. It seemed a good opportunity to get some useful information, so the writer asked Mr. Jumper, specification engineer for the company, which of these methods had worked out best in practice. He said that he had a decided preference for the field conveyor belt, as at the Irwindale plant, only two men are required in the pit, the load is steady and the conveyor once installed requires very little attention. The work of changing the belt and adding extra sections is not onerous. At the same time he admitted that the dinkey and dump cars or motor trucks had decided advantages in other situations. But the method of drawing a car from the shovel up an inclined track he liked the least, as it confined the

Primary crushing plant and belts

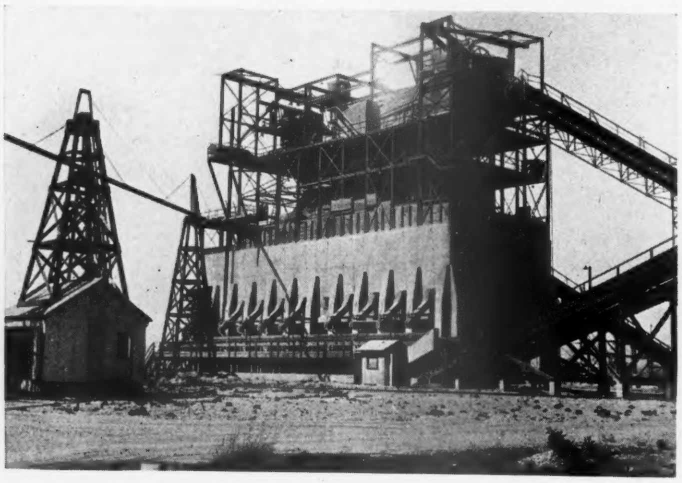
Steam shovel and hopper over end of field belt



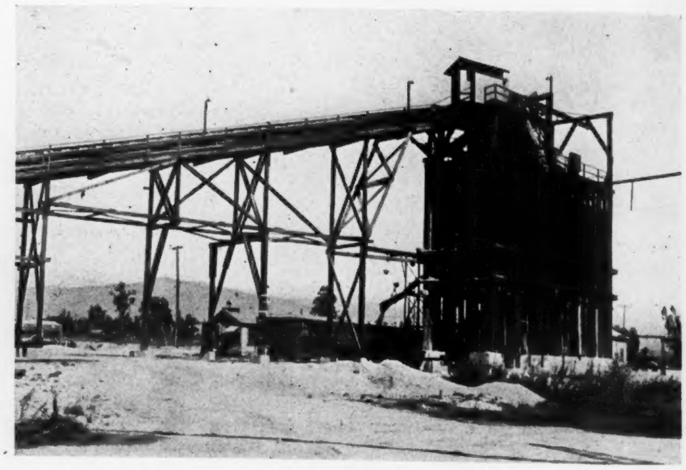
First screening unit, containing scalper screen and gyratory crusher



Second unit, containing secondary revolving screen and two cone crushers

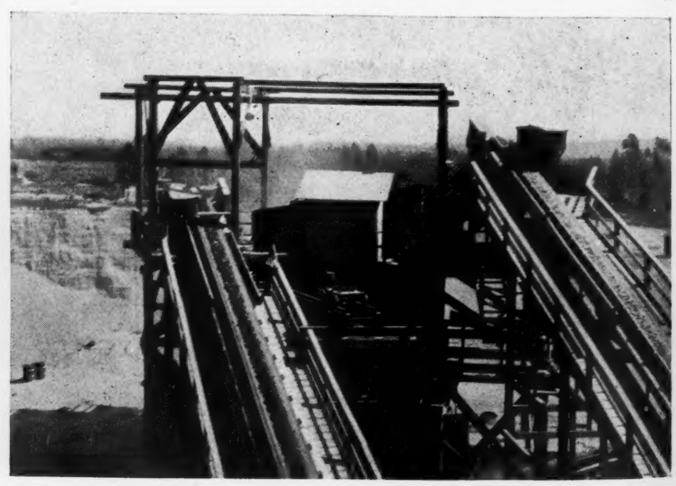


Washing plant with concrete bins and a three-deck structure for washing and screening machinery



Proportioning plant for washing and shipping mixtures of sizes

Looking down on various units from the washing plant



Parallel belts from first to second unit

work to too narrow a working area, and there was rather more labor and maintenance required than with the field belt.

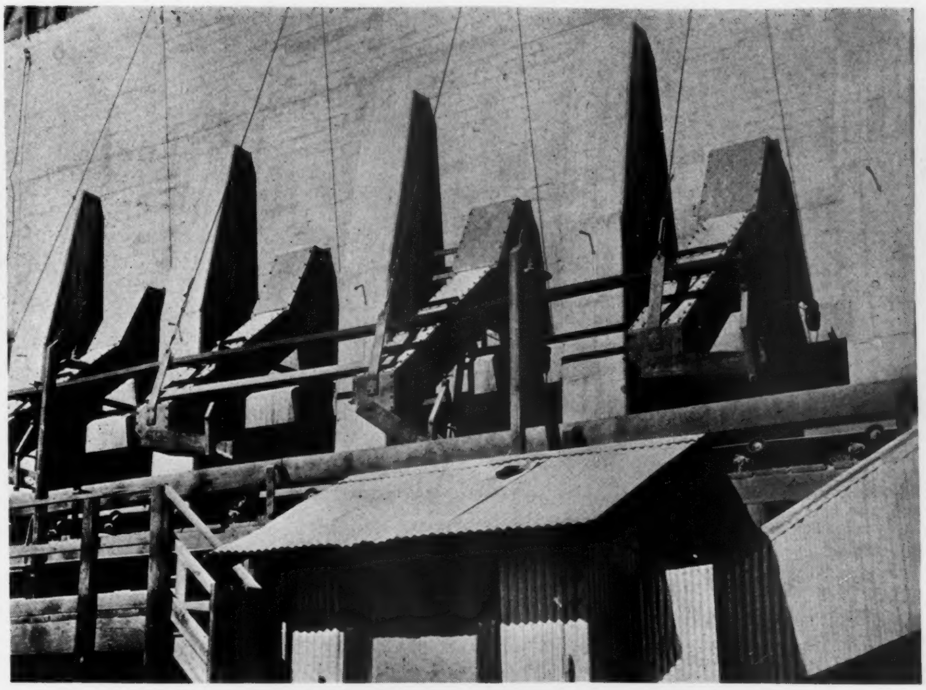
The belt just described discharges to the feed hopper of a 36-x42-in. jaw crusher of the Blake type, made by the Llewellyn Iron Works, Los Angeles. This is in a small building in the pit, which is partly below ground. The discharge of the crusher and the uncrushed material falls on another 42-in. belt, which is 590 ft. centers. This is at about a 30-deg. incline, and it conveys the material out of the pit and to the top of the first unit of the crushing, screening and washing plant.

Crushing and Screening

This unit contains the scalping screen and the first of the secondary crushers. The scalping screen is 8 ft. in diameter and 18 ft. long. There is a main section and two jackets with 4-in. and 2½-in. round holes and 1 5/16-in square holes. The oversize (4-in. and larger) goes by a chute to a 14-in. Traylor "Bull Dog" gyratory crusher. The crusher discharge goes by a 24-in. belt of 140-ft. centers to the secondary revolving screen, which is in the second plant unit. The intermediate size (4-in. to 2½-in.) goes by a parallel belt to the same unit and the

2½-in. to 1 5/16-in. size goes to the same belt although it may be handled separately if this is desirable. The undersize, 1 5/16-in. down, goes by a 30-in. belt that is at right angles to the other to the washing plant. This belt is 320 ft. long and is fitted with a take-up.

The secondary screen which receives the "Bull Dog" crusher discharges has 4-in. and 2½-in. holes. It is 5 ft. in diameter and 16 ft. long. The oversize goes to a 5½-ft. and a 4½-ft. Symons cone crushers. There is no return of the discharge from these crushers to the secondary screen. The whole crusher product goes by a 30-in. belt of 325 ft. centers to the washing plant.

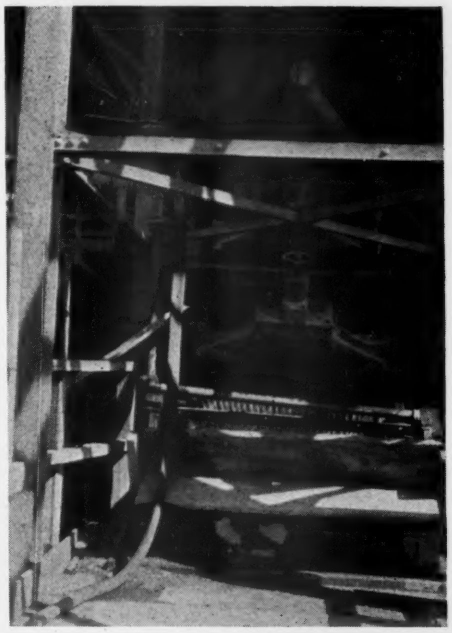


Spouts to mixing belt, set for half, full and no discharge

Distinction Between "Rock" and "Gravel"

The two intermediate sizes from the scalping screen (all between 4-in. and 1 5/16-in.), it will be remembered, are sent to the second plant unit by a belt parallel with that which carries the "Bull Dog" crusher discharge. This material does not go the secondary screen. It is fed directly to the two cone crushers and falls on the 30-in. belt that goes to the washing plant.

Hence there are two kinds of materials going to the washing plant. The first is everything minus 1 5/16-in., which was taken out by the scalping screen and sent directly to the washing plant. The second is all crushed material, containing everything coarser than 1 5/16-in. in the original feed. But it has now been crushed, everything above 4-in. first in the "Bull Dog" and afterward in the cone crushers, and the portion between 4-in. and 1 5/16-in. in the cone crushers only. All this crushed material is known as "rock" and is given a separate treatment and handling from the minus 1 5/16-in. portion, which is known as "gravel and sand."



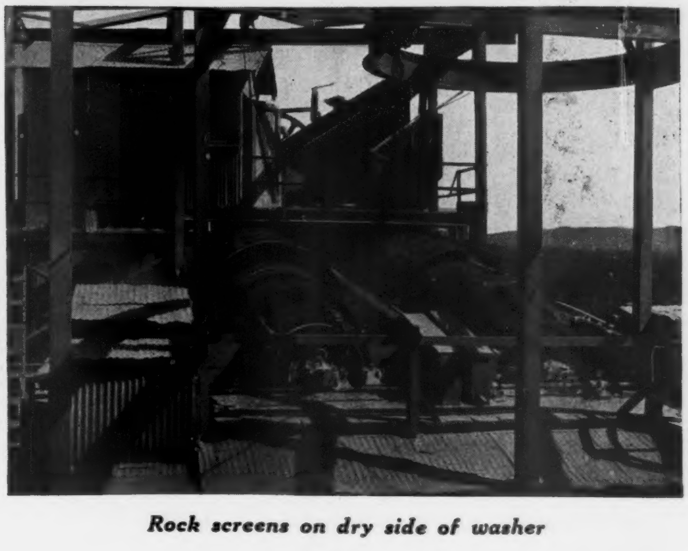
Wet vibrating screen for removing pea gravel from sand

Washing and Sizing

The washing plant handles both these materials, although it only washes one of them, the gravel and sand mixture. It is a beautiful structure, a block of buttressed concrete bins about 100 ft. by 40 ft., with a steel superstructure carrying screening and washing machinery on three decks. The "rock" goes from the conveyor to two rotary screens, 5 ft. in diameter and 20 ft. long on an upper deck, which have 1¾-in. and 1⅛-in. holes. The oversize (plus 1¾-in.) is of slabby pieces that go to a special bin and are sent back to the cone crushers as they accumulate. The 1¾-in. to 1⅛-in. size goes to a battery of six "Hum-mer" vibrating screens which make the finer sizes and screenings, all going to bins.

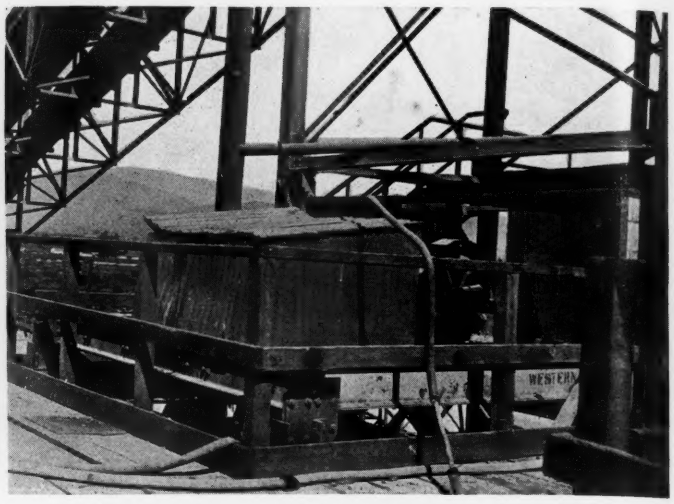
The stream of sand and gravel goes to two rotary screens 5 ft. in diameter and 24 ft. long, which are run wet. They have 1¼-in. and ½-in. holes. The oversize and the sizes between 1¼-in. and ½-in. are sent to bins as No. 2 and No. 3 gravel. The minus

Scalping screen has a main section and two jackets



Rock screens on dry side of washer

Six electric vibrating screens on dry side of washing plant

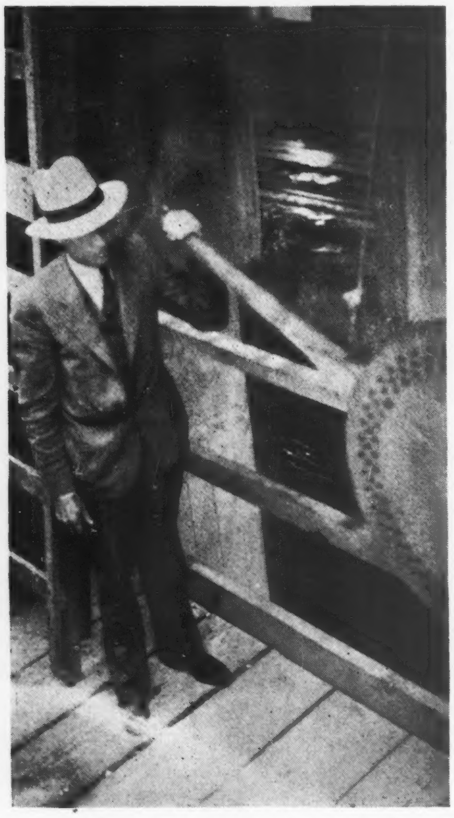


Head equipment and motors of sand classifiers

½-in. size goes to two "Hum-mer" screens which are run wet. These take out the ½-in. to ⅜-in. pea gravel. The undersize (minus ⅜-in.) is sand, and this goes to two rake type classifiers of the Conveyor Co.'s design and make. The sand goes to bins and the waste is pumped to a settling pond.

Shipping Facilities

The bins hold about 2000 tons. They may be discharged to trucks, on one side, to railroad cars which are on tracks underneath the bins, or through chutes on the other side to a mixing belt. This last has a very ingenious method of regulating the flow from a spout, which is shown in two of the accompanying views. The spout that comes out of the bin is closed at the end with a short cross spout that is pivoted at the back so that the discharge end can be raised and lowered. The more it is lowered the faster the material runs out of the spout. There is no gate in the usual sense of the word, the flow being regulated by the inclination of the cross spout and the way it closes the main spout. The raising and lowering is by a rope attached to a hand lever that moves over a circular plate with holes. A pin in one of the holes holds the lever in any desired place and so controls the flow of material.



Setting a spout to mixing belt

The setting can be made very closely; Mr. Jumper told the writer that when it is desired to make such a mixture as 60-15-25 the setting is first made by the eye and the discharge of the belt sampled and a sieve test made. An adjustment and a second sampling often show the mix to be correct, and in almost all cases a third setting is certain to give the correct mix.

The final unit, called the proportioning plant, is a set of bins to which the mixing belt discharges. These are designed to hold any mixed products (or unmixed if this is desirable) for loading. There is a washing screen 4 ft. in diameter and 12 ft. long, with ⅜-in. holes, over which any material may be passed; but only the gravel is washed, the other products being by-passed. Spouts from these bins permit loading into railroad cars or trucks.

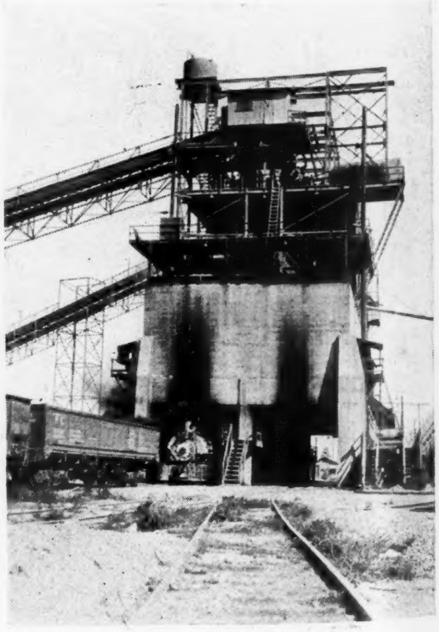
As the San Gabriel wash is a great underground water reservoir, from which Los Angeles and other cities get a large part of the water they use, abundant water for washing may be obtained from wells. There are two of these in use, both fitted with Layne-Bowler turbine pumps which produce about 2200 g. p. m.

Materials are carried in stockpiles at the rear of the plant site and here too are the storage tracks for full and empty railroad cars. Loading in and out of stockpiles is by a locomotive crane.

While the above description and the views may give a good idea of the flow of the material and the equipment, they do not do justice to the excellent construction and numerous little details that make operation easy. Such are the feed arrangements to the revolving screens, for example. The feed spout is on a frame on wheels so that it can be pushed away from the screen when repairs or changes have to be made. There are a number of such clever arrangements. The capacity of the plant is 500 tons per hour and it could be crowded to a higher tonnage if the market demanded it. The products made are sand, pea gravel, No.'s 1, 2, and 3 gravel and No's. 1, 2, 3 and 4 crushed rock. Numbers are also given to some of the mixtures which are made on the belt.

The plant is one of a number owned and operated by the Consolidated Rock Products Co., which supplies so much of the building material used in and near Los Angeles.

The officers of the company are: Ford J. Twaits, president; L. L. Rogers, production and distribution manager; Robert Mitchell, secretary; Walter Moore, sales.



End view of washing plant

Results of Freezing and Thawing Tests on Sand-Lime Brick*

By H. F. McMurdie

Prefatory Abstract

IN ORDER to determine the importance of absorption requirements in specifications for sand-lime brick as a measure of weather resistance, 22 sets of 10 half-brick each, having various absorption properties previously determined, were subjected to 50 alternate cycles of freezing and thawing. No apparent relation was found to exist between the amount of absorption and the resistance to freezing and thawing. It was found, however, that a brick having both a fast rate of absorption in partial immersion and a high strength was likely to withstand freezing and thawing satisfactorily.

Outline

I. Introduction.
II. Materials studied.
III. Test procedure.
  1. Rate of absorption during partial immersion.
  2. Absorption during total immersion.
  3. Density and volume.
  4. Freezing and thawing.
  5. Strength.
IV. Results.
  1. Individual specimens.
  2. Averages of different makes.
V. Discussion of results.
  1. Individual specimens.
  2. Averages of different makes.
VI. Conclusions.
VII. Acknowledgments.

TWO of the properties which render a brick useful and valuable are strength and resistance to the action of weather. Specifications for the selection and grading of brick should place desired limits on these two major properties. The measurement of either compressive or transverse strength of brick may be easily and directly made, and with such accuracy that strength requirements can be incorporated in specifications.

The second property, weather resistance, cannot be measured directly, as this would require the simulation of a certain "controlled sort of weather" in the laboratory over an extended period of time. This is obviously impracticable, since excessive cost and loss of time are involved. Thus it became necessary to resort to accelerated tests and the absorption properties of brick were seized upon as the panacea for this dilemma.

It is relatively easy to find out how much water a brick will absorb. This can be determined by immersion either in water at room temperature or in boiling water. On the assumption that water absorption is a measure of pore space which in turn is related to the behavior of the brick when undergoing freezing and thawing, it can be seen how the belief came about that percentage absorption is related to weather resistance.

Thus until recently absorption limits were included in most brick specifications and these were based on data from perhaps too limited a number of specimens. Then (too often) requirements which were embodied in early specifications as representing the "best thought" on the subject (at the time) have become so venerated with age that they have become "sacred axioms." They may even have become so revered as to be considered "beyond the range of any doubt." Obviously there could have been no progress along this line had this sentiment continued and increased in favor.

Such, though, has not been the case. There has been increasing evidence indicating that absorption properties of building materials generally are not related to weather resistance.

Wilson[1] found that absorption tests are of little value as a criterion of quality of concrete. In discussing Wilson's paper, Bates states that the tendency is away from absorption tests on building materials. Whittemore[2], in considering hollow building tile, found that "absorption is not an absolutely reliable guide as to the ability of a tile to resist frost action," and "its use without reference to freezing and thawing tests would seem dangerous."

McBurney[3] has found in an investigation of clay bricks that "on the basis of data here recorded and on field observations it is considered that water absorption or apparent porosity of brick is not a measure of resistance to climatic action." Palmer and

*Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

[1] Wilson, Raymond, "The Limitations of the Absorption Test for Concrete Products," Proceedings of the American Concrete Institute, 1929, page 522.

[2] Whittemore, O. J., "Absorption: Its Relation to Durability," Journal of the American Ceramic Society, Vol. 13, No. 1, page 80.

[3] McBurney, J. W., "The Water Absorption and Penetrability of Brick," A. S. T. M. Proceedings, 1929.

TABLE 1. DESCRIPTION OF BRICKS

Brick No.	Size in inches	Size of panel, inches	Color	Texture	Remarks
2a	8 x3¾x2¼	5x1½x⅛	Light red	Fine	
5	8 x3¾x2¼	....	Yellow grey	Coarse	Surface rough
6	8 x3¾x2¼	....	Grey	Fine	Contained nodules of lime
7	8¼x3¾x2¼	6x1½x⅜	White	Medium	Varied ¼ in. in depth
8	8 x3⅝x2¼	....	Grey	Medium	Contained stones up to ¼ in.
9	8 x3¾x2¼	....	Yellow grey	Medium	Contained stones up to ¼ in.
10	8¼x4 x2½	....	White	Coarse	
11	8 x3¾x2¼	....	Grey	Medium	
12	8 x3¾x2¼	....	Yellow grey	Coarse	Surface rough. Laminated obliquely
13	8¼x4 x2⅜	....	Light red	Coarse	Contained cinders and nodules of lime
14	8 x3¾x2½	....	Grey	Fine	Contained stones up to ¼ in.
15	8 x3¾x2½	....	Light brown	Medium	
16	8 x3¾x2½	Oval 5x2x¼	White	Coarse	
*16a	8 x3¾x2½	Oval 5x2x¼	White	Coarse	
17	8 x3¾x2¼	....	White	Medium	
18	8 x3¾x2¼	6x1½x⅜	White	Fine	Contained nodules of lime
19	8¼x3¾x2¼	....	Grey	Medium	
20	8 x3⅝x2¼	4x1½x¼	White	Coarse	
21	8 x3¾x2½	....	Light brown	Medium	Covered with loose lime
22	8 x3¾x2¼	....	White	Medium	Contained nodules of lime
23	8 x3¾x2¼	....	White	Medium	Pressure face rough
24	8 x3¾x2¼	....	Grey	Medium	
25	8 x3¾x2¼	....	Light brown	Medium	Contained nodules of lime

*Brick No. 16a was made by the manufacturer of Brick No. 16, using a different lime.

TABLE 2. PROPERTIES OF INDIVIDUAL HALF BRICK OF MAKE 16A

	Wt. dry, grams	Per cent. absorption 48 hr. cold	5 hr. boil	Grams absorbed per 1000 cc. brick 72 hr.	5 hr. boil	Schurecht Ratio	Palmer Ratio	Density	Pct. absorption after freezing	Wt. dry after freezing	Comp. strength, lb./sq. in.
1	2	3	4	5	6	7	8	9	10	11	12
Brick No. 9	952	16.2	23.2	269	381	0.700	0.706	1.64	18.7	958	3050
Brick No. 9′	950	15.5	22.1	261	370	0.702	0.706	1.68	......	......	3600
Brick No. 16	1082	11.9	17.9	218	326	0.666	0.669	1.80	13.4	1092	5700
Brick No. 16′	1092	11.9	17.7	219	320	0.673	0.684	1.81	......	......	4400
Brick No. 17	1069	12.5	18.3	227	327	0.683	0.695	1.78	15.0	1073	5360
Brick No. 17′	1084	12.0	17.8	222	322	0.675	0.690	1.81	......	......	5500
Brick No. 23	981	13.8	20.2	242	350	0.684	0.692	1.73	15.7	987	5050
Brick No. 23′	976	15.9	21.6	270	365	0.737	0.740	1.69	......	......	3750
Brick No. 25	1016	14.8	20.9	257	357	0.709	0.720	1.71	17.5	1020	2830
Brick No. 25′	983	13.8	20.2	241	350	0.652	0.689	1.73	......	......	4200
Brick No. 28	1064	11.8	18.2	216	327	0.649	0.661	1.79	13.4	1075	6300
Brick No. 28′	1096	12.1	18.5	218	331	0.641	0.658	1.78	......	......	4900
Brick No. 35	1031	12.8	19.7	227	344	0.650	0.660	1.75	15.9	1032	6040
Brick No. 35′	1047	13.7	17.9	251	322	0.766	0.779	1.81	......	......	4600
Brick No. 39	1090	11.6	17.9	212	323	0.648	0.656	1.80	13.4	1097	6150
Brick No. 39′	1097	12.3	18.2	224	326	0.677	0.687	1.80	......	......	5150
Brick No. 43	992	14.6	21.0	251	358	0.696	0.701	1.70	16.5	994	4750
Brick No. 43′	960	14.9	21.5	253	364	0.694	0.695	1.69	......	......	2100
Brick No. 46	992	14.0	20.4	241	350	0.687	0.688	1.72	17.2	995	4660
Brick No. 46′	992	14.5	19.9	254	346	0.729	0.735	1.74	......	......	3950

TABLE 3. PROPERTIES OF INDIVIDUAL HALF BRICK OF MAKE NO. 22

	Wt. dry, grams	Per cent. absorption 48 hr. cold	5 hr. boil	Grams per 1000 cc. brick 216 hr.	5 hr. boil	Schurecht Ratio	Palmer Ratio	Density	Pct. absorption after freezing	Wt. dry after freezing	Comp. strength, lb./sq. in.
1	2	3	4	5	6	7	8	9	10	11	12
Brick No. 1	951	12.9	18.0	247	322	0.716	0.768	1.79	15.1	950	4650
Brick No. 1′	903	12.7	18.0	243	322	0.706	0.756	1.78	......	......	4150
Brick No. 5	892	15.0	21.9	266	366	0.686	0.726	1.67	19.4	889	5150
Brick No. 5′	868	15.0	22.0	268	371	0.682	0.722	1.68	......	......	3550
Brick No. 7	882	13.1	18.3	241	325	0.716	0.742	1.78	14.9	884	6150
Brick No. 7′	916	12.9	18.0	238	323	0.718	0.738	1.79	......	......	5800
Brick No. 15	813	15.0	21.8	270	365	0.690	0.740	1.68	18.3	813	3650
Brick No. 15′	835	15.3	22.4	275	372	0.684	0.740	1.66	......	......	3400
Brick No. 21	915	12.6	17.7	238	318	0.712	0.750	1.80	15.5	909	5000
Brick No. 21′	909	12.8	18.4	240	326	0.696	0.736	1.77	......	......	5050
Brick No. 28	869	15.4	22.0	281	367	0.700	0.746	1.67	19.6	776	3150
Brick No. 28′	816	16.3	23.3	285	381	0.700	0.748	1.63	......	......	3050
Brick No. 37	866	14.0	20.8	256	354	0.674	0.724	1.70	18.8	826	....
Brick No. 37′	831	14.2	20.9	257	356	0.680	0.722	1.70	......	......	3200
Brick No. 38	957	12.4	18.1	236	324	0.686	0.728	1.79	14.2	952	4850
Brick No. 38′	926	12.4	18.0	233	323	0.690	0.722	1.79	......	......	4000
Brick No. 43	854	13.2	19.0	257	333	0.696	0.772	1.76	17.5	696 F*	....
Brick No. 43′	934	12.7	18.6	248	329	0.682	0.754	1.77	......	......	4200
Brick No. 46	932	13.1	18.6	239	328	0.706	0.730	1.77	15.0	930	4150
Brick No. 46′	904	13.3	19.0	245	335	0.700	0.732	1.76	......	......	3450

*F indicates that the brick was considered to have failed.

TABLE 4. PROPERTIES OF INDIVIDUAL HALF BRICK OF MAKE NO. 14

Specimen	Wt. dry, grams	Per cent. absorption 48 hr. cold	Boiled	Grams per 1000 cc. 168 hr. cold	5 hr. boil	Schurecht Ratio	Palmer Ratio	Density	Pct. absorption after freezing	Weight dry after freezing	Compressive strength flat, lb./sq. in.
1	2	3	4	5	6	7	8	9	10	11	12
No. 2	979	12.8	18.1	252	326	0.707	0.773	1.80	15.6	971	3900
No. 2′	1014	13.2	18.9	259	336	0.699	0.772	1.78	......	......	2550
No. 6	1045	15.3	19.9	287	347	0.770	0.828	1.74	......	Broken 38 cycles	....
No. 6′	968	12.1	16.4	237	294	0.738	0.806	1.79	......	......	2700
No. 10	902	16.8	22.6	302	376	0.744	0.804	1.66	......	Broken 47 cycles	....
No. 10′	977	15.5	22.2	290	372	0.698	0.780	1.68	......	......	2600
No. 27	1048	11.9	16.6	240	307	0.717	0.781	1.85	14.4	887 F*	....
No. 27′	1002	13.2	17.7	253	320	0.746	0.791	1.81	......	......	3100
No. 32	992	15.5	21.4	291	364	0.725	0.800	1.70	......	Broken 38 cycles	....
No. 32′	952	16.1	20.3	299	352	0.793	0.850	1.73	......	......	2900
No. 33	993	16.1	21.2	289	366	0.760	0.790	1.65	......	Broken 33 cycles	....
No. 33′	950	15.2	20.8	283	357	0.734	0.793	1.71	......	......	2500
No. 39	1008	15.6	19.2	296	338	0.813	0.876	1.75	......	Broken 36 cycles	....
No. 39′	964	15.0	19.9	292	349	0.755	0.837	1.79	......	......	2300
No. 46	1016	13.3	18.4	258	331	0.724	0.780	1.79	17.1	838 F*	....
No. 46′	962	14.8	19.7	282	344	0.752	0.820	1.75	......	......	3750
No. 48	1064	12.5	16.9	246	312	0.740	0.790	1.84	13.5	1053	3900
No. 48′	1040	11.9	16.6	237	308	0.717	0.770	1.85	......	......	3050
No. 49	998	12.9	17.7	257	326	0.729	0.789	1.81	13.0	871 F*	....
No. 49′	1018	13.9	18.5	266	331	0.752	0.804	1.78	......	......	3300

*F indicates that the brick was considered to have failed.

Hall[4] have likewise found no evidence that absorption is of use as an index to the weather resistance of face brick made from clay or shale.

Sand-lime brick were not included in any of the above tests. Therefore, an investigation was undertaken to obtain data pertaining to the absorption properties and the resistance of sand-lime brick to alternate freezing and thawing of water saturating them. These tests were made on the tacit assumption that they more or less paralleled actual weather conditions and this would be a quick indication of the performance of such brick in ordinary service.

If the assumption is valid that freezing and thawing tests parallel actual weather conditions, then by comparing the absorption properties of a brick with its resistance to freezing and thawing, we can know whether or not such absorption properties are related in turn to *actual* weather resistance.

In this investigation, 10 brick from each of 23 different manufacturers were used. First the various absorption properties of these brick were measured. The brick were then subjected to 50 cycles of freezing and thawing to ascertain their relative resistance to weather and the resistance so measured was compared to their absorption properties to see whether any direct correlation could be formulated.

Materials Studied

Lots of 50 brick each, representative of regular production, were received from 25 different producers for an investigation described in a previous paper entitled "The Absorption and Strength of Commercial Sand-Lime Brick."[5] The range of absorption of each manufacturer's product was obtained by boiling the bricks in water for five hours. Ten brick (except in the cases of Nos. 12 and 20 when there were seven and nine respectively) of each make representing the whole range of absorption were reserved for the investigation described herein. The remaining 40 brick of each shipment were broken transversely and the resultant halves broken in compression. The complete data relating to the strength and absorption of these brick may be found in the previous paper[5] and portions of these are again presented in this report.

The description of the brick used in the present investigation is recorded in Table 1. The sample numbers in both papers refer to the same brick.

Test Procedure

1. *Rate of Absorption During Partial Immersion*—The brick were first dried to constant weight in an electric oven at a temperature of 110 ± 5 deg. C. and then cooled. They were then placed flat side down (supported on small glass rods) so as to be partially immersed to a depth of about ⅛-in. in water. At the end of definite time intervals (usually every one, two, three, four, five, 10, 20, 30 and 60 minutes) each brick was removed from the water, wiped with a damp cloth, weighed, and reimmersed. Twenty seconds were allowed to complete each weighing. In some cases the entire surface of the brick became wet in less than 60 minutes, after which further gain in weight was very slow. These rapidly absorbing bricks were removed from the water as soon as they were completely wetted. These tests were repeated in some makes of brick with the opposite flat side immersed.

2. *Absorption During Total Immersion*—Each brick was then sawed into halves and these were dried to constant weight and cooled. Then they were completely immersed in water at room temperature. At the end of 48 hours they were removed, wiped with a damp cloth, reweighed and returned to the water. This procedure was repeated every 24 hours until the gain in weight was less than one gram between weighings. After this condition had been reached, the half bricks were kept in boiling water for five hours, and allowed to cool in water to room temperature. They were then weighed, first while suspended under water and again in air after they had been wiped with a damp cloth.

3. *Density and Volume*—The difference between the weights (in grams) in air and under water is the bulk volume (in cc.) of the brick. From this and the original dry weight the density of the brick can be calculated. The volume measurement was also of use in calculating the absorption on a grams per unit volume basis.

4. *Freezing and Thawing*—The half brick were again dried to constant weight and again completely immersed in water at room temperature. One of the halves of each brick was removed after 48 hours and placed face downward in the freezing chamber in pans containing about ½-in. of water, where they remained for 20 hours at a temperature of from —5 to —10 deg. C. They were then thawed by immersion in water (for four hours) at normal room temperature. They were then replaced in the freezing room. As soon as a specimen broke or showed considerable disintegration it was removed. Otherwise it endured 50 freezing and thawing cycles. The "twin" halves remained immersed in water during this period of freezing and thawing. A brick was considered to have failed in freezing and thawing if it lost 10% or more of its original weight as a result of the treatment.

5. *Strength*—At the conclusion of the 50 cycles the half bricks were first weighed then dried to constant weight. They were then capped with plaster of Paris and broken in compression flatwise. The strength tests were made by the method prescribed by the current standards of the American Society for Testing Materials. The half bricks which had remained stored in water during the time that the freezing and thawing was in progress were also capped with plaster of Paris, dried for two months in air, and broken in compression flatwise. A comparison of the compressive strengths of the halves which were frozen and thawed with those which remained in water at room temperature during the same period of time indicates whether or not the brick lost strength as a result of the alternate freezing and thawing.

IV. Results

Tables 2, 3, and 4 present the data for the individual specimens of makes No's. 16a, 22, and 14, respectively. Brick No. 16a is a typical example of a set which had no failures. There was only one failure in the case of No. 22. The individual test data on this make of brick were given in detail in the previous paper.[5] No. 14 is a typical example of a make of brick which showed a large percentage of failures, there being 80% of such during the 50 cycles of freezing and thawing.

In each of these tables in Column 5 are the absorptions expressed as grams per 1000 cc. bulk volume of brick, when the rate of absorption had dropped to less than one gram in 24 hours. The number of hours required for this condition to be reached is given at the top of the column. Column 6 shows the absorption after boiling for five hours on this grams per unit volume basis.

Schurecht's Ratio (Column 7) is obtained by dividing the absorption after 48 hours cold immersion by that after five hours of boiling. This ratio is a modification of Kreuger's[6] ratio, from which it differs in that it is based on apparent porosity as measured by absorption by boiling rather than by measurements of densities. Palmer's[7] ratio, obtained by dividing the absorption when saturated in cold water by the absorption after boiling at least five hours, is recorded in Column 8.

In all three of these tables the first half brick of each pair is the one which was subjected to freezing and thawing. The half which was only soaked is marked by the "prime" (′).

Averages of Different Makes

The average, maximum, and minimum absorption values for the various makes of brick are recorded in Table 5. Column 2 gives the amounts of water absorbed in five minutes' partial immersion. This provides a basis for comparison of the rates of absorption. In most cases the rate of absorption was approximately the same through both flat sides of the individual brick. Among

[4] Palmer, L. A. and Hall, J. V., "Some Results of Freezing and Thawing Tests Made with Clay Face Brick," A. S. T. M. Proceedings, 1930.

[5] McMurdie, H. F., "The Absorption and Strength of Commercial Sand-Lime Brick," ROCK PRODUCTS, November 23, 1929.

[6] Kreuger, H., Utredning rorande klimatisk inverkan pa byggnadsfader, Ingenoirs Vetenskaps Akademien, No. 24, page 72, 1923.

[7] Palmer, L. A., "Some Absorption Properties of Clay Brick," Bureau of Standards Research Paper 88, page 106, 1929.

TABLE 5. WATER ABSORPTION OF SAND-LIME BRICK

Brick No. 1	Partial immersion g. water in 5 min. (2) Max.	Min.	Ave.	Percentage absorption 48 hours, cold (3) Max.	Min.	Ave.	Percentage absorption 5 hours, boiling (4) Max.	Min.	Ave.	Grams per 1000 cc. brick, Cold (5) Max.	Min.	Ave.	Grams per 1000 cc. brick, 5 hours boil (6) Max.	Min.	Ave.	Percentage of absorption after freezing, average 7
16a	323*	103	209	16.2	11.6	13.8	23.2	17.7	19.9	270	212	243	381	320	345	15.7
25	273*	96	153	14.0	11.7	12.9	20.7	17.3	18.8	257	222	239	354	309	332	16.4
16	305*	191	252	15.6	12.2	13.4	22.8	17.9	19.9	269	226	253	377	324	345	16.1
24	45	29	35	15.9	11.2	13.1	20.9	15.1	17.5	285	217	249	360	288	319	14.3
15	57	25	37	12.8	8.4	10.4	16.8	11.0	13.8	254	187	219	315	231	273	12.7
8	64	45	54	17.4	12.5	15.7	23.0	16.5	20.6	301	239	279	380	305	353	17.3
2a	38	18	29	13.6	10.9	12.1	16.1	12.9	14.5	260	220	238	299	255	277	12.9
22	156	32	53	16.3	12.4	13.7	23.3	17.7	20.2	285	233	253	381	323	342	16.8
6	20	12	19	13.5	10.6	11.9	17.9	13.4	15.3	246	208	226	322	261	288	12.8
9	61	30	47	13.3	10.1	11.9	18.6	15.5	17.1	256	211	236	330	292	312	14.4
20	196	24	98	16.7	12.1	14.0	21.3	17.1	19.1	299	239	266	360	311	333	17.3
13	55	32	46	19.5	14.4	17.1	24.8	18.1	21.6	311	238	283	394	316	357	17.9
23	39	20	33	14.8	10.3	11.8	19.3	13.9	15.9	264	201	225	337	268	294	14.0
7	275*	62	171	16.3	13.3	14.5	23.0	19.8	21.4	287	250	264	378	345	361	19.1
10	91	34	54	14.4	10.0	12.1	20.7	13.9	17.1	280	211	245	353	268	320	14.3
19	53	40	48	15.0	12.5	13.8	20.2	16.8	18.5	271	241	257	355	313	335	15.2
21	102	24	58	18.4	10.0	13.8	25.0	13.7	18.8	312	208	258	398	268	330	12.8
11	91	31	60	17.5	11.5	14.3	23.4	16.9	19.9	310	231	270	386	313	349	14.4
17	106	25	52	15.0	11.8	13.1	19.8	16.8	18.0	277	226	248	345	310	324	14.2
18	127	37	58	18.3	12.7	15.5	22.5	16.7	19.4	308	230	276	372	306	337	13.9
14	137	32	73	16.8	11.9	14.2	22.6	16.4	19.1	302	237	271	376	294	338	14.5
12	90	27	58	15.2	10.1	11.8	20.4	13.8	15.8	282	202	234	350	269	295	11.5
5	108	58	74	11.7	10.2	11.0	16.7	14.5	15.7	226	207	218	304	278	294	......

*Entire surface became wet within 5 minutes time.

TABLE 6. AVERAGE ABSORPTION AND STRENGTHS OF SAND-LIME BRICK

Brick No. 1	Partial immersion, grams of water 5 min. 2	Percentage of absorption 48 hr. cold 3	5 hr. boil 4	Schurecht's Ratio 5	Grams of water per 1000 cc. brick Cold 6	5 hr. boil 7	Palmer's Ratio 8	Density 9	Percentage failures 10	Comp. strength, lb. per sq. in. After soaking 11	After freezing 12	Strength of original forty, lb. per sq. in. Modulus of rupture 13	Comp., flat 14
16a	209	13.8	19.9	0.689	243	345	0.699	1.74	....	4215	4900	715	3570
25	153	12.9	18.8	0.687	239	332	0.719	1.77	....	3495	3875	510	3210
16	252	13.4	19.9	0.673	253	345	0.705	1.74	....	4160	4805	650	3820
24	35	13.1	17.5	0.747	249	319	0.779	1.83	....	3755	4030	550	3400
15	37	10.4	13.8	0.757	219	273	0.802	1.99	....	3935	3850	830	4050
8	54	15.7	20.6	0.763	279	353	0.790	1.72	10	4000	4750	730	4465
2a	29	12.1	14.5	0.839	238	277	0.862	1.92	10	4885	5300	820	5120
22	53	13.7	20.2	0.696	253	342	0.740	1.74	10	3850	4600	615	3880
6	19	11.9	15.3	0.783	226	288	0.787	1.89	20	3305	4020	550	3770
9	47	11.9	17.1	0.695	236	312	0.758	1.82	20	3850	4150	690	3930
20	98	14.0	19.1	0.736	266	333	0.792	1.75	22	3000	3500	515	3420
13	46	17.1	21.6	0.796	283	357	0.795	1.65	30	4500	4500	685	5050
23	33	11.8	15.9	0.747	225	294	0.764	1.85	30	4875	5900	930	5500
7	171	14.5	21.4	0.675	264	361	0.731	1.68	30	2590	2990	600	2810
10	54	12.1	17.1	0.707	245	320	0.789	1.82	40	3835	4980	565	4230
19	48	13.8	18.5	0.749	257	335	0.767	1.81	50	2865	3400	530	3370
21	58	13.8	18.8	0.729	258	330	0.780	1.78	60	2700	3980	385	2630
11	60	14.3	19.9	0.720	270	349	0.774	1.76	60	2890	3540	680	3170
17	52	13.1	18.0	0.727	248	324	0.764	1.80	70	2880	3350	620	2910
18	58	15.5	19.4	0.797	276	337	0.817	1.74	70	2950	3900	500	3330
14	73	14.2	19.6	0.741	271	338	0.802	1.76	80	2875	3900	530	3040
12	58	11.8	15.8	0.742	234	295	0.800	1.87	85	2300	2670	400	2700
5	74	11.0	15.7	0.700	218	294	0.746	1.87	100	2560	....	335	2460

TABLE 7. PHYSICAL PROPERTIES OF SAND-LIME BRICK VERSUS RESISTANCE TO FREEZING AND THAWING

(Results obtained with 10 specimens of each brick)

Absorption: Brick below 19% absorption on boiling, Brick No.	Per cent. failures	Absorption: Brick above 19% aborption on boiling, Brick No.	Per cent. failures	Modulus of rupture: Brick above 600 lb. per sq. in. modulus of rupture, Brick No.	Per cent. failures	Modulus of rupture: Brick below 600 lb. per sq. in. modulus of rupture, Brick No.	Per cent. failures	Compressive strength: Brick above 3500 lb. per sq. in. compressive flat, Brick No.	Per cent. failures	Compressive strength: Brick below 3500 lb. per sq. in. compressive flat, Brick No.	Per cent. failures
25	0	16a	0	16a	0	25	0	16a	0	25	0
24	0	16	0	16	0	24	0	16	0	24	0
15	0	8	10	15	0	6	20	15	0	20	22
2a	10	22	10	8	10	20	22	8	10	7	30
6	20	20	22	2a	10	10	40	2a	10	19	50
9	20	13	30	6	10	19	50	22	10	21	60
23	30	7	30	9	20	21	60	6	20	11	60
10	40	11	60	13	30	18	70	9	20	17	70
19	50	18	70	7	30	14	80	13	30	18	70
21	60	14	80	11	60	12	85	23	30	14	80
17	70	....	....	17	70	5	100	10	40	12	85
12	85	....	....	22	10	....	....	....	....	5	100
5	100	....	....	....	....	....	....	....	....	....	....
Ave.	37	Ave.	31	Ave.	21	Ave.	48	Ave.	16	Ave.	57

the exceptions, the more permeable side is that which was not in contact with the plunger in pressing. Brick with panels or frogs were tested on only the flat, faster absorbing side. Therefore, to make all results comparable, the higher of the two readings is referred to in all cases.

The bricks were immersed in cold water until the rate of absorption was not greater than 1 gram per 24 hours. The absorptions at the end of this time, expressed as grams of water per 1000 cc. bulk volume of brick, are recorded in Column 5. Column 6 shows the absorptions after boiling expressed as grams per unit volume. In the last column are the average percentages of absorption of those brick which were frozen, as determined after completion of the freezing cycles.

The averages from Table 5 are repeated in Table 6. Column 10 shows the percentage of brick of each make which failed during the 50 cycles of freezing and thawing. The average flat compressive strengths of the brick which remained in water during the period of freezing and thawing are given in Column 11, Table 6. Columns 13 and 14 are reproduced from the previous paper[5] and express the moduli of rupture and flat compressive strengths of the 40 brick of each make.

In both Tables 5 and 6 the data for each respective make of brick are arranged in order of decreasing resistance to freezing and thawing as indicated by the percentage failures and the per cent. loss in weight of the surviving specimens.

Discussion of Results

1. *Individual Specimens*—Having measured the absorptions, the densities, and the strengths of these bricks, it is desired to relate, if possible, these readily determinable factors to resistance to freezing and thawing. First consider the results obtained on individual half bricks of one make. In doing this the effects of certain unknown factors are minimized. These are the size and shape of the sand grains, the amount of pressure applied in molding, and the pressure and duration of steaming. Relations which might be found under such limited conditions would not necessarily obtain when two different makes of brick are compared. In such a case these unknown factors play a part and they may be of great importance and overshadow relations which would be apparent where these differences in materials and workmanship were eliminated.

Considering Brick No. 14 (Table 4) it is evident that the half brick of high absorption were the ones which failed. This was found to be true to a less degree in other makes. It would seem that within a group of brick of one make and reasonably homogeneous throughout, a higher absorption indicates a lower resistance to freezing and thawing. This relation might hold very well for more homogeneous material. A stone or lump of lime was found to be at the origin of the fracture of many of the brick which broke during the freezing and thawing. This tends to obscure any relation which might otherwise be found.

With no exceptions, specimens of Brick No. 16a increased noticably in weight during the freezing and thawing. This may have been due to an increased hydration of the calcium silicate cementing material in the brick.

The degree of saturation of specimens was increased in every instance by freezing and thawing. According to these results the ratio between the amount of water a brick contained and its total capacity increased as the freezing and thawing cycles were continued.

2. *Averages of Different Makes*—Since the data are so arranged in Table 6 that the most resistant brick head the list, inspection shows that absorption, calculated on the basis of either percentage by weight or grams per unit volume, bears little relation to resistance to freezing and thawing. Apparently neither Schurecht's nor Palmer's ratio is related to this property. These ratios are measures of the proportions of total pore space filled with water after cold soaking. They are thus inversely proportional to the residual space into which the freezing water can expand.

Since water expands approximately 10% on freezing, it has been assumed that if the pore ratio is 0.9 or less, the residual pore space is sufficient to relieve internal pressure. With reference to clay brick, Kreuger concluded that if the pore ratio (coefficient of saturation) was 0.85 or less that the brick was likely to withstand freezing and thawing satisfactorily. The data indicate that this is not true in so far as sand-lime brick are concerned. Note that Brick No. 5 had 100% failures and an average ratio of only 0.7.

A factor to be considered in this connection is the increase in absorption which takes place as a result of freezing and thawing. While a brick may contain only enough water to give a ratio of 0.7 initially, the absorption may increase with freezing and thawing until 0.9 or more of the void space is filled with water. The amount of such increase during freezing and thawing is shown by comparison of Column 3 with Column 7 in Table 5.

During the freezing process the excess water and ice was in some cases apparently forced from the interior of the brick through the pores. When the brick were removed from the freezing room to thaw, a coating of ice 1/8 to 1/4 in. thick was found on the surfaces of Brick No's. 16, 16a, 25 and 7. These brick were also found to have very fast rates of absorption during partial immersion. These facts seem to indicate that size and shape of pores (indicated by the variation in rates of absorption) are factors of moment in relieving internal stresses caused by expansion of the water on freezing.

An examination of the data also reveals that the most resistant bricks had the highest rates of absorption. The rather large percentage of failures in Brick No. 7 (also rapidly absorbing) is possibly explained by the fact that its strength was below average. The strength data were obtained with the 40 brick of the same make in the previous work. The data indicate, therefore, that a rapidly absorbing brick of high strength will withstand freezing and thawing cycles satisfactorily. This is without any regard to total absorption.

The half bricks which survived the 50 cycles of freezing and thawing had higher compressive strength than the corresponding halves ("twins") which were stored in water during the same period. A like increase in strength on freezing and thawing has been noted by both Kirkpatrick and Palmer[8] and Peppel.[9] Peppel believed that the increase was due largely to carbonation of the excess lime. Another possible explanation is that there is further hydration of the calcium silicate, which is presumably the binder in sand-lime brick. This explanation is supported by the observed increase in dry weight of many specimens. However, little is known about the hydrated calcium silicates which are formed in the manufacture of this product. A study of the compounds of lime and silica and their hydrates might help to explain these phenomena.

Table 7 is a recapitulation of the data of Tables 1 to 6 inclusive. First the 23 sets are divided into two groups on the basis of absorption. An average of 37% failures was found with those sets of 10 brick each which had an average absorption of less than 19% on boiling, while those sets over 19% had an average of 31% failures. Next the 23 sets are grouped according to the modulus of rupture. Those having moduli of rupture above 600 had fewer failures than those below that figure. The difference is even greater when the sets are grouped on the basis of compressive strength. The sets that had an average compressive strength above 3500 lb. per sq. in. show an average of only 16% failures per set, while the sets averaging below 3500 lb. average 57% of failures per set. These data in Table 7 show that both the modulus of rupture and compressive strength are more indicative of resistance to freezing and thawing than total absorption. Therefore, since strength requirements are usually contained in brick specifications, nothing is gained by adding absorption requirements.

Since strength and rate of absorption seem to be related to resistance to freezing and thawing, it is well to consider the factors which determine these properties. The grading of sand and amount of pressure used in shaping the brick are very likely the main

[8] Kirkpatrick, H. A., and Palmer, J. S., "Evidence of the Durability of Sand-Lime Brick," Proceedings of the Sand-Lime Brick Association, 1918.

[9] Peppel, S. V., "Manufacture of Artificial Sand-Stone or Sand-Lime Brick," Bulletin 5, Ohio Geological Survey, 1905.

factors which affect the rate of absorption. These two things, together with the amount and fineness of lime and the pressure and duration of steaming, are very likely the important factors determining the strength.

The factors which would cause a rapid rate of absorption, i.e., lack of proper amount of fine material and small amount of pressure, would be also likely to produce a high total absorption. The fineness of the lime and the steaming are very likely unimportant in their effect on the percentage absorption of a brick. Therefore it would seem strange indeed if there were a relation between total absorption and resistance to freezing and thawing when different makes of brick are considered. When brick of one make are considered the size distribution, the pressure used and the steaming are in all cases more approximately the same. The variations in these important factors are minimized and in such a case any relation between absorption and weather resistance which might exist would be more apparent.

Conclusions

1. In general, among brick of one make, those lowest in total absorption were those which withstood alternate freezing and thawing most satisfactorily.

2. Freezing and thawing was attended by an increase in compressive strength of those sand-lime brick which survived such tests.

3. Any relations which may have existed between total absorption of a brick and its resistance to freezing and thawing were obscured when the data obtained with all the makes of brick were considered. This lack of relation was equally apparent whether the absorption on a percentage or a concentration basis is considered.

4. Neither Schurecht's nor Palmer's modifications of Kreuger's ratio were in any way definitely related to the resistance to freezing and thawing of the sand-lime bricks studied.

5. As a rule, sand-lime brick which had a rapid rate of absorption and high strength withstood freezing and thawing relatively satisfactorily. This statement is without reference to total absorption.

6. Whether there is or is not any relation between the ability of a brick to withstand the freezing and thawing test and its serviceability when exposed to the weather, the data presented herein show that there is no relation between its ability to withstand the freezing and thawing test and the amount of water which it will absorb. There is, therefore, no reason for continuing the requirement as to total absorption in specifications for sand-lime brick. The use of a requirement as to rate of absorption might well be considered.

Acknowledgments

The writer wishes to extend his thanks to Messrs. Murray, Wells, and Palmer for many helpful suggestions and criticisms given by them during the course of the investigation. The co-operation of the various manufacturers who furnished the material for this study is also appreciated.

Trade in Magnesite in 1930

OF THE MAGNESIUM compounds common in modern trade, both basic and derived, the natural mineral magnesite undoubtedly has the widest world distribution and commercial use, says a report by Joseph Ulmer of the minerals division, U. S. Department of Commerce, in *Commerce Reports.*

Demand has resulted in the development of magnesite deposits convenient to centers of great industrial consumption; many others might easily be brought into production. The mineral also meets keen competition from manufactured magnesite compounds and participates in industry, aside from refractory and cement use, in proportion to favorable price conditions in the open market. Among competitive materials, dolomite is the most important, followed by the chemically produced magnesium salts, resulting as by-products from the treatment of brines.

Magnesite occurs as two distinct varieties —massive or compact resulting from the alteration of serpentine rocks, and crystalline, usually associated with limestones and dolomites.

The interest of the United States is largely in magnesite that may be used in two somewhat distinct industries—the production of refractory products, furnace and kiln linings and the preparation of oxychloride cements.

Crude magnesite in itself does not enter commerce to an appreciable extent, the few sales being made directly to the chemical industries. Like limestone, to which it is closely allied, magnesite must be calcined to be utilized satisfactorily. As a refractory in the metal industries, the dead-burned grades are in greatest demand and require a raw material low in calcium and containing small quantities of iron. The reaction to calcining processes makes a naturally pure primary mineral desirable, and the high quality of the Austrian magnesite, consequently, has become outstanding in world markets.

Imports supply 50 to 60% of the demand for magnesite in the United States. Receipts in 1930 totaled 106,516 short tons of crude, calcined and dead-burned magnesite as compared with 132,429 in 1928 and 111,352 in 1929. Imports of calcined in 1930 amounted to 3357 short tons, valued at $77,013, and of dead-burned to 46,936 tons, worth $702,456.

Austria and Czechoslovakia are clearly outstanding among American sources of supply. Russia appeared in the market for the first time in 1929. In 1930 it supplied 656 short tons of dead-burned magnesite, valued at $10,221. Development of the large Satka deposits may make it a strong competitor of central European countries for sales in America.

Since consumption of dead-burned magnesite in America is largely by the metal industries, the bulk of the requirement is met by Austrian magnesite, although, recently, dead-burned magnesite from Quebec has been rising in importance, and Pacific Coast metallurgy depends on magnesite from California and Washington.

Prices for dead-burned magnesite showed a distinct drop during 1930, but in no way proportionate to sales. Prices for caustic calcined magnesite, on the other hand, while fluctuating throughout the year, evidenced strength toward the end of 1930.

Notable price competition is being experienced by the Greek producers because of the activity of Russian, Yugoslav and Austrian magnesite, and the future has been described as "distinctly gloomy."

Russian exports of magnesite by fiscal years have been reported as 1059 metric tons in 1925-26, 2585 in 1926-27, 8371 in 1927-28, 16,448 in 1928-29 and 28,825 in 1929-30.

Practically the entire production in India is calcined and shipped, unground, to Europe and the United States for use in oxychloride cements. The increase in the United States import duty on calcined magnesite in 1927 resulted in a heavy reduction in the tonnage exported to America from India.

Granite as Dimension Stone

A PRELIMINARY REVIEW has been made of trends in the production and uses of block granite by the U. S. Bureau of Mines and is discussed in Report of Investigations No. 3065. It is said in this report that some unfavorable conditions were brought to light. Suggestions regarding a more orderly and consistent growth in the industry are discussed.

The block granite industry has shown little expansion during recent years. While the value of the annual production has grown from about $14,000,000 in 1904 to nearly $25,000,000 in 1928, the increment in value is caused mainly by mounting prices rather than by increased production. Even granite for memorials shows a very small advance in production volume, although the value has increased from about $3,500,000 in 1904 to more than $11,000,000 in 1928, which is the most consistent growth of any branch of the industry. The value of building granite has fallen for a number of years much below the figure for 1904, and in 1928 was very little in advance of the value attained 24 years previously. The use of granite paving blocks and rubble has declined.

The stagnation in the building granite industry is in sharp contrast with the activity in the production of many other building materials of mineral origin.

Remedies for lack of substantial growth can not be easily prescribed, but a statement of conditions as they now exist and as they have existed for the past 25 years may assist in pointing the way to development.

Bulldozer with tractor used in moving stripping at dump

At foot of incline, showing type of dump cars used

Modernizing the Screening and Washing of Crushed Stone

Plant of C. C. Beam, Inc., Melvin, Ohio—An Example of the Reconstruction Developments Current and Pending in the Quarry Industry

IN THE INTERESTS of greater efficiency and a better product some radical changes have been made at the plant of C. C. Beam, Inc., Melvin, Ohio. The old revolving screens were taken out and a new arrangement of vibrating screens installed. Along with the screen changes an additional recrushing unit consisting of a 10-in. Newhouse crusher was added. The rearrangement of part of the structure necessitated by these changes was taken care of with new steel construction.

The original dry screening plant was built in 1924, and then in 1928 the washing end was added to permit the washing of about half of the product. Now most of the output, or even all of it if desired, may be washed.

The special features of the new screening and washing layout are the ability to divert practically any screened size on the dry end to either the recrushers for further crushing or to the wet end for washing and sizing, and also to obtain clean sizing and washing by using plenty of screen area and by keeping the minus 1½-in. material separate from the plus 1½-in. on the washing end.

This diversion of sizes is shown on the flow sheet and is accomplished in part by the relative locations of the screens and by gates in the spouts. Scalping is done in four steps on two double-deck screens with hoppers and spouts so arranged that these sizes may go either to the recrushers direct or to the elevator carrying up to the sizing screens. Considerable flexibility of operation is thus obtained.

A total of 12 vibrating screens of one kind are used, 2 for scalping, 3 for dry sizing, and 7 for wet sizing.

Also of interest is the use of a surge bin between the primary crusher and the rest of the plant, whereby a uniform feed is maintained to the screens and recrushers, and a reclaiming hopper under one of the railroad loading tracks for putting material back through the plant.

Stripping

The stone deposit at this quarry is overlaid with about 10 to 12 ft. of soil, which at the present time is being dumped back into the quarry at one side where operations have been discontinued.

Quarry face, showing method used of throwing shot out and leveling it as much as possible

It is excavated with a 1-yd. crawler type steam shovel, loading to two 6-yd. side-dump Koppel cars on standard gage track. The cars are moved to the dump by an 8-ton Plymouth gasoline locomotive. In this way about 125 cars or 600 to 700 yd. of stripping are moved per day with 8 men.

Overcoming Handicap of a Slipping Fill

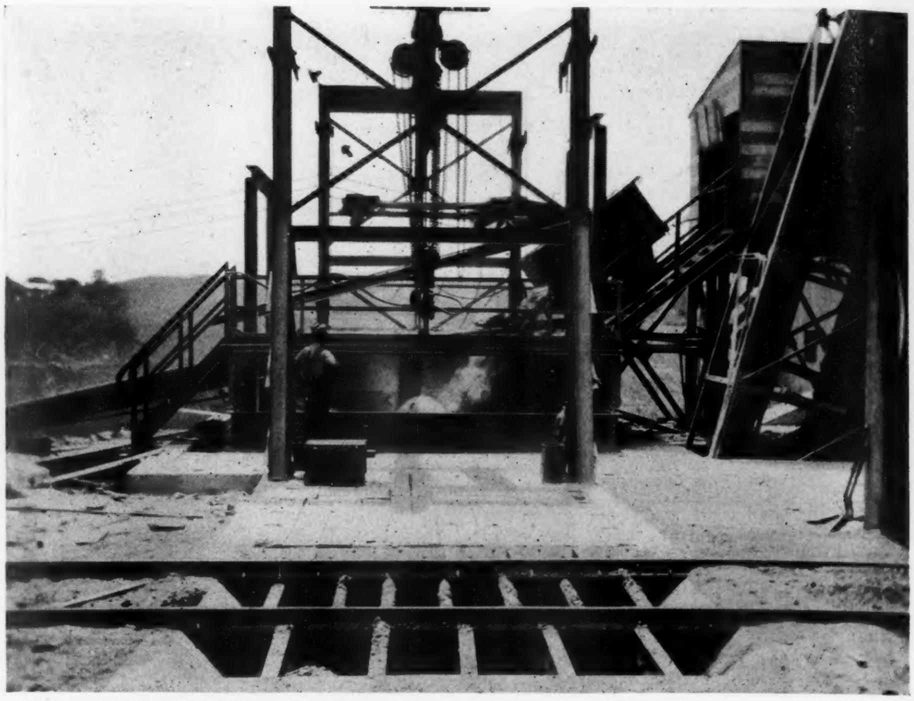
Because of the nature of this clayey soil which has a tendency to slide when wet, quite a little trouble was experienced at first in holding the track on top of the dump, but this has been overcome in a very satisfactory manner by keeping the track well back from the edge of the fill and then pushing the dumped material over to the edge with a "30" Cletrac gasoline tractor having a "bulldozer" mounted on the front end as shown in one of the pictures. Three or four moves of the tractor effectively dispose of each train load.

Quarrying

Blast-hole drilling is done with three Loomis tractor type drills, one of these being a large new machine of the No. 44 size, and the other two the No. 22 size. The No. 44 and one of the No. 22 machines are electric-motor driven, while the third is gasoline-engine driven. On this rock the No. 44 machine drills about 80 ft. of hole per 10-hour day.

The deposit is a dolomitic stone and a 50-ft. face is worked, with the holes spaced about 9 ft. apart each way.

The method of shooting and loading is interesting and different from most quarrying operations. Instead of the usual practice of loading the holes only heavy enough to get the required breakage without moving the rock out from the face any more than necessary, here the loading is heavier with the object of throwing it out and leveling it, at the same time thoroughly breaking it up. Approximately 165 lb. of explosive is used per hole, which gives a ratio of 2 tons of rock per pound of explosive on the primary blasting. This of course is quite a little more explosive than ordinarily used, but the necessary secondary blasting is correspondingly reduced.



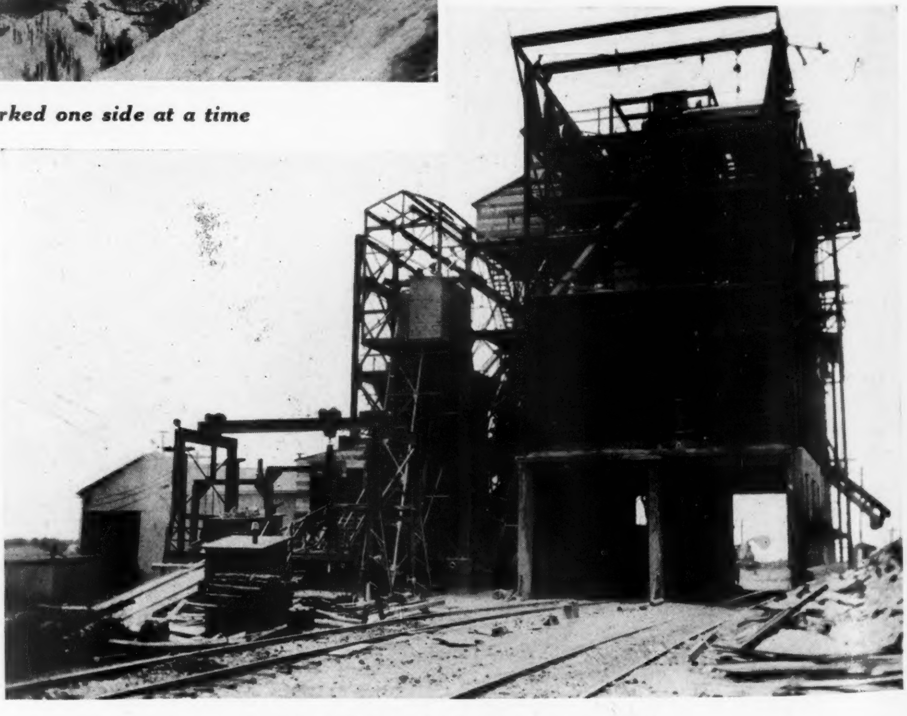
Dumping position at primary crusher

Note the way quarry is worked one side at a time

An Unusual Operation

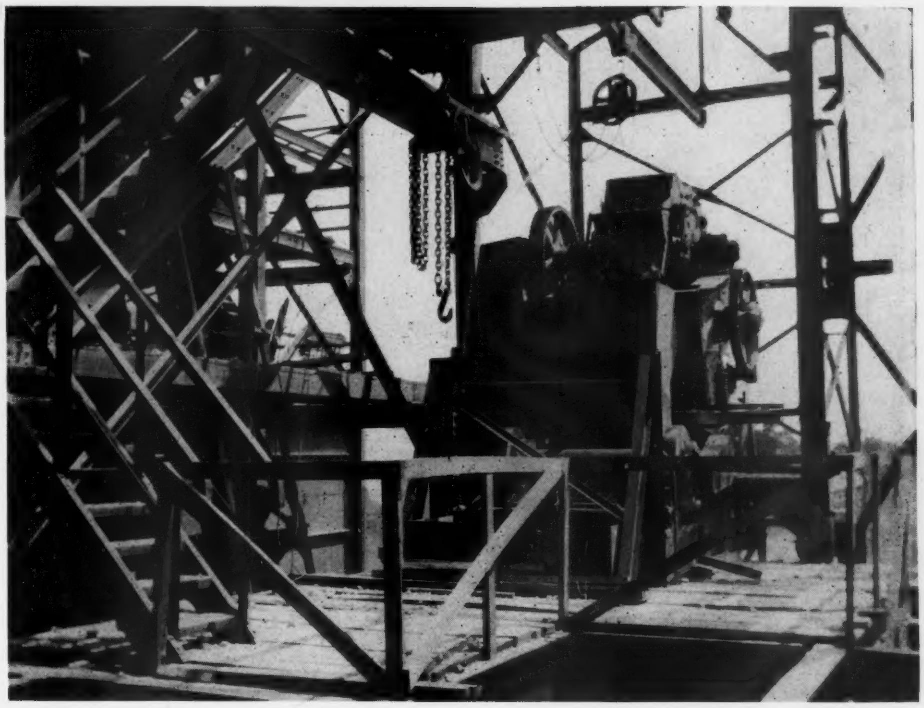
The explosive is a chlorate of potash powder equivalent in strength to a 40% dynamite, and is made locally as needed, at a cost of some 3c to 5c per lb. less than the cost of dynamite, it is said.

This method of blasting would not

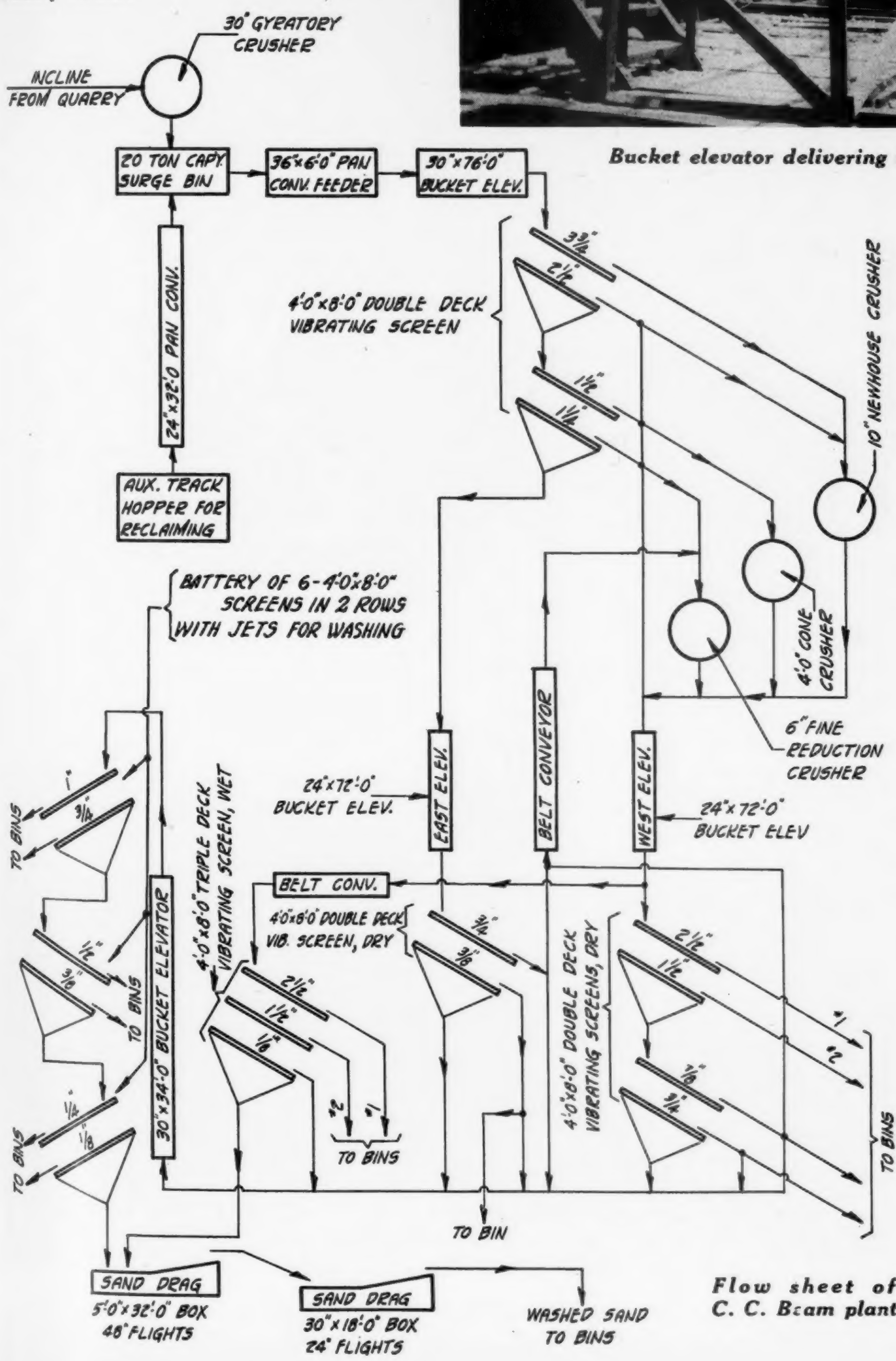


View of plant before being covered

work in the ordinary quarrying operation where the loading track runs parallel to the face, because of covering the track, but in this case the whole scheme of operation is different. The quarrying method used is to work each half of the face alternately, drilling and shooting one end to the extent of about 40,000 to 50,000 tons of rock, while the other end is being loaded by the shovel, and then doing the same thing at the other end. To avoid too much concussion only six or seven holes are shot at a time, which is equivalent to about 2,000 tons of rock per shot. One row at a time is shot, and as the rock at this deposit does not break back, few holes are lost by reason of making such small shots. Following these shots any large pieces visible are plug-drilled with jackhammers and broken down with secondary shots.



Bucket elevator delivering to vibrating scalping screen



Flow sheet of C. C. Beam plant

Cordeau-Bickford fuse is used on the primary shots, and electric exploders on the secondary shooting. These are considered to be much safer under the circumstances than ordinary fuse. Two of the pictures show the way in which the rock is blasted out and the scheme of loading.

A Model 61 Marion crawler type steam shovel with a 2½-yd. dipper is used for loading, in connection with a ¾-yd. Type B Erie steam shovel on wheels, the latter being used to clean up the edges of the pile or to start a cut for the larger shovel. Easton 4-yd. steel end dump quarry cars are used in trains of four cars each. These are hauled to the foot of the incline by two 5-ton Plymouth gasoline locomotives on a 4-ft. gage track.

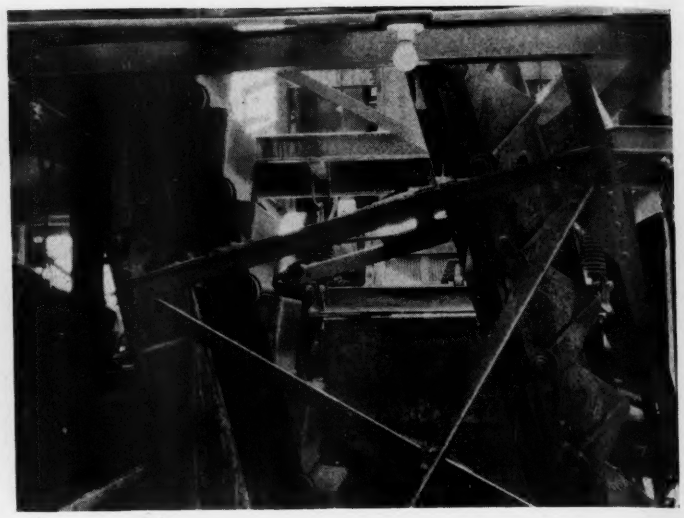
The quarry is kept drained normally by means of a 6-in. Fairbanks-Morse centrifugal pump with a direct-connected 20-hp. motor, which is arranged for automatic operation with a float switch, while another pumping unit of the same size with a 25-hp. motor is kept as a reserve and for emergency use.

Crushing and Screening Equipment

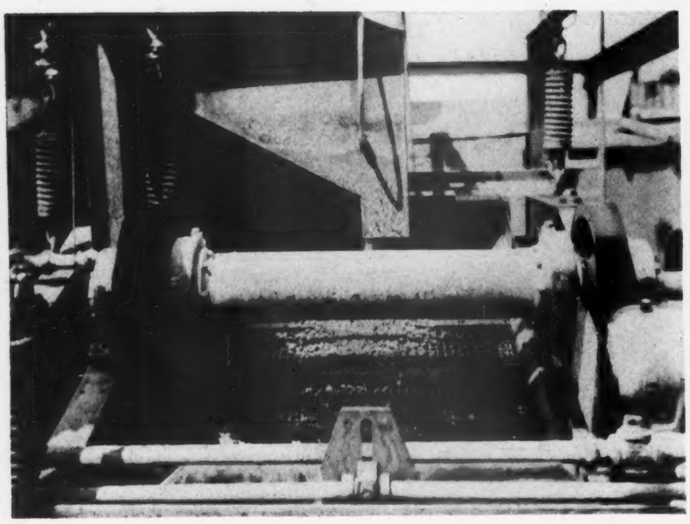
The cars from the quarry are pulled up an incline, one at a time, by a cable and drum hoist and automatically tripped and discharged to the primary crusher, a 30-in. "Superior" McCully gyratory. This crusher and the hoist are belt driven by a 200-hp. 4-cylinder Fairbanks-Morse semi-diesel oil engine. A similar oil engine of the 100-hp. 2-cylinder size drives the 4-ft. cone crusher, all the other equipment being electric-motor driven.

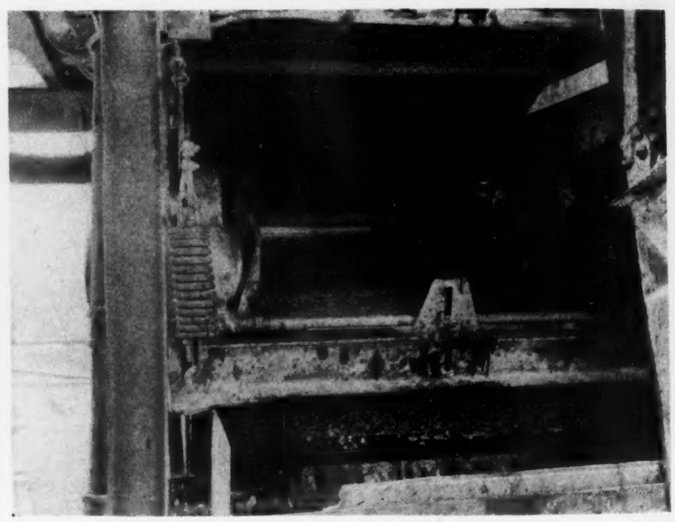
From the primary crusher the stone falls into a steel bin of 20 tons capacity,

Three recrushers, fine reduction crusher, and 10-in. gyratory crusher

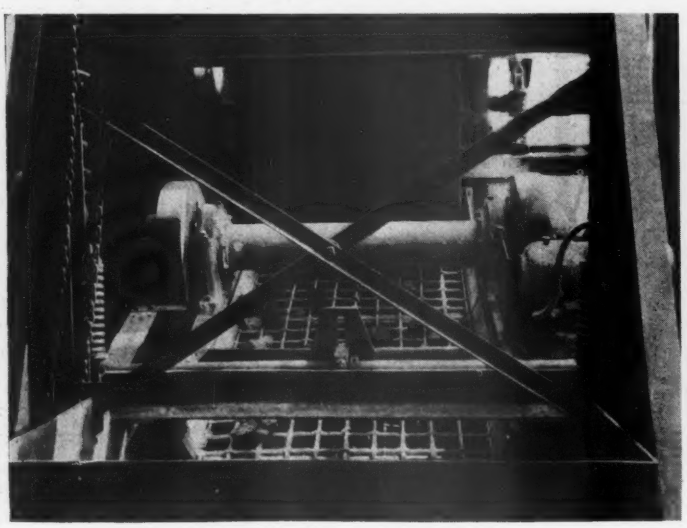


Type of super-capacity elevators used for handling materials

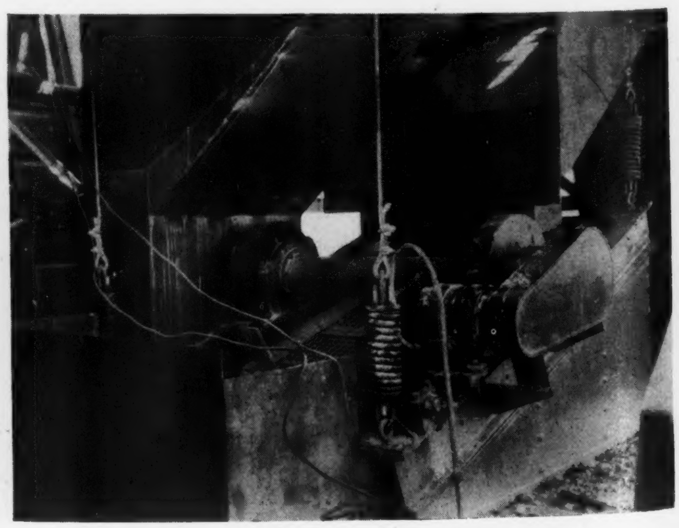




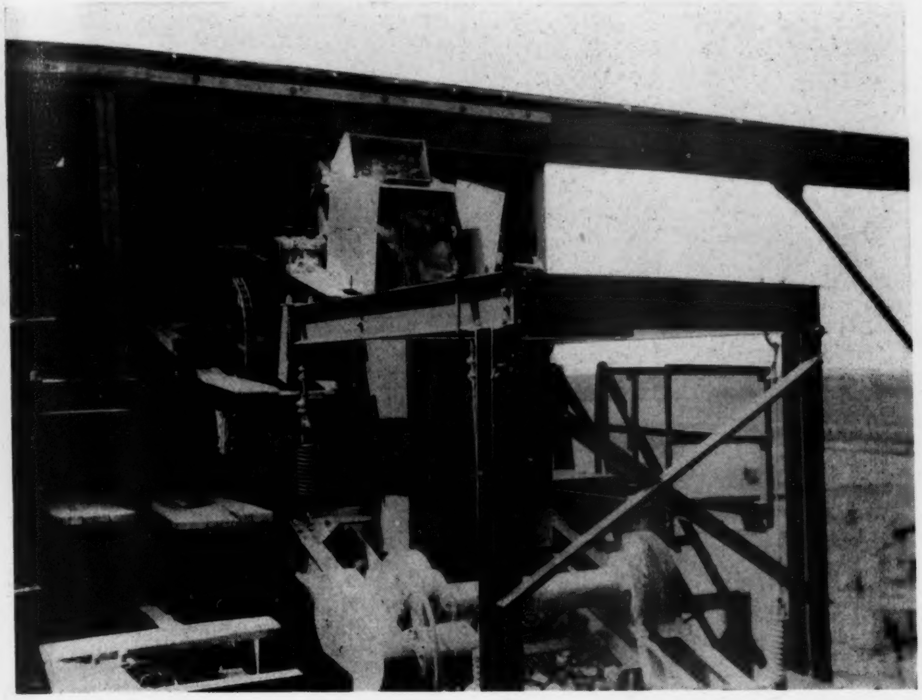
Two of the wet sizing screens. All vibrating screens are suspended by cables and springs to prevent vibration of building



Front view of 4x8-ft. double-deck vibrating scalping screen



Lower of two double-deck scalping screens



The 24-in. bucket elevator discharging coarse material for final dry sizing

from which it is fed on a 36-in. by 6-ft. Webster steel pan conveyor feeder to a 30-in. by 76-ft. Webster super-capacity bucket elevator carrying up to the scalping screens. The feeder is driven by a 3-hp. Allis-Chalmers, variable-speed motor through a Falk speed reducer, and is so arranged that the feed to the plant will not exceed 200 tons per hour. The 30-in. bucket elevator is driven by a 40-hp. Allis-Chalmers, slip-ring motor through a Texrope drive to the elevator countershaft.

All elevators are of the link and wheel type traveling on an inclined track.

Scalping is done on two double-deck 4-ft. by 8-ft. Allis-Chalmers vibrating screens, one above the other, with decks of 3¾-in., 2½-in., 1½-in., and 1¼-in. mesh wire cloth, and so arranged that each size coming over the three lower decks may be either spouted to the recrushers or to the elevator feeding the dry sizing screens.

Three recrushers are used, a 10-in. Newhouse gyratory crusher, a 4-ft. Symons cone crusher, and a 6-in. McCully fine reduction gyratory crusher. The material coming over the top deck is spouted to the 10-in. Newhouse, as is also that over the second deck, while that over the third deck may be spouted to the 4-ft. cone crusher and that over the fourth deck to the 6-in. fine reduction crusher.

The discharge from the three crushers, and also when desired the sizes coming over the three lower decks of the scalping unit, are spouted to a 24-in. by 72-ft. Webster bucket elevator carrying up to two of the dry sizing screens.

The minus 1¼-in. size through the lower deck of the scalping unit is carried upon a duplicate parallel bucket elevator to the other dry sizing screen.

These three screens, which are also 4-ft. by 8-ft. double-deck, Allis-Chalmers vibrating screens, make the dry separation of the various sizes as indicated on the flow sheet. These sizes are then either spouted direct to the bins, to the short elevator feeding the washing screens, or carried back to the 6-in. fine reduction crusher on a short belt conveyor.

Arrangements are also made so that the elevator discharge to the two dry screens may be diverted on a short belt conveyor to a 4-ft. by 8-ft. triple-deck, Allis-Chalmers vibrating screen with 2½-in., 1½-in. and ⅛-in. mesh wire cloth and jets for washing, where No. 1 and No. 2 washed stone may be produced. As much of the minus 1½-in. material as desired may be diverted from the three dry screens to the short elevator feeding the wet screens.

Washing

All of the minus 1½-in. material from the dry end intended for washing is carried up on a 30-in. by 34-ft. Webster super-capacity bucket elevator and divided equally to two parallel rows of vibrating screens, three screens in tandem, one above the other in each row. These six screens are each 4-ft. by 8-ft. Allis-Chalmers, double-deck vibrating screens with jets for washing and with 1-in., ¾-in., ½-in., ⅜-in., ¼-in. and ⅛-in. mesh wire cloth.

The material through the lower deck of each screen feeds to the screen below, as indicated on the flow sheet, and the minus ⅛-in. material through the bottom screen flumes to a 5-ft. by 32-ft. Webster sand dewatering box with 48-in. drag conveyor flights. The discharge from this box is flumed with additional water to another dewatering box with Morrow 24-in. drag conveyor flights, from which it discharges to the washed sand bin.

The bins have 12 compartments of about 80 tons capacity each, over two railroad loading tracks, six compartments for dry sizes and six for wet sizes.

Water for washing is supplied by three pumps, one drawing its supply from the settling reservoir and two from the adjacent creek. These pumps are 4-in. Allis-

Looking down on one of the dry sizing screens

Chalmers centrifugals with direct-connected 40-hp. motors.

The 12 Allis-Chalmers vibrating screens are of heavy construction and are each hung from above on four wire cables and coiled springs as shown in some of the pictures, which keeps vibration out of the building. The Texrope drives are protected by solid metal guards.

The individual units and drives in the plant are tabulated below.

Both the 10-in. Newhouse crusher and the 6-in. McCully fine reduction crusher have reversing switches included in their controls so that they may be reversed and more readily started under load.

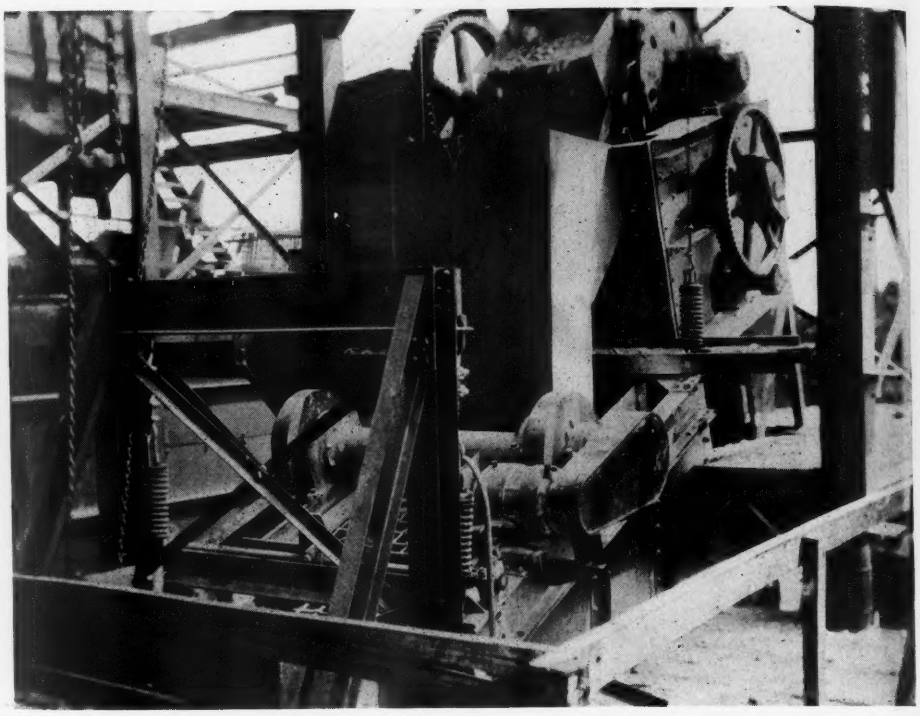
Allis - Chalmers, Cutler - Hammer and General Electric controls are used, with Westinghouse snap switch starters for the screens.

A steel track hopper located under one of the loading tracks opposite the surge bin at the primary crusher provides a convenient way of putting back through the plant any material from the stockpiles or bin via railway cars. A 24-in. by 36-ft. Webster steel pan feeder driven by a 3-hp. G.-E. motor carries the material to the surge bin, from which it is fed to the plant.

General

The capacity of the plant is now 1500 to 2000 tons per 10-hour day, depending upon what sizes are being made. About one-third is local truck delivery and two-thirds railroad shipments, the plant being located on the Baltimore and Ohio railroad. Railroad loadings are weighed over a 125-ton Fairbanks track scale, and trucks over a 15-ton Fairbanks platform scale. A 55-ton American steam locomotive is used for switching and a 20-ton Industrial locomotive crane with 1½-yd. clamshell bucket for stockpiling.

The purchased electric power is obtained from the Dayton Power and Light Co. at 13,000 volts and transformed down at the plant to 3-phase, 60-cycle, 220-volts. All machinery is motor-driven except the primary crusher, car hoist and 4-ft. cone crusher. These are belt driven from two Fairbanks-Morse semi-Diesel oil engines, one a 200-hp. and the other a 100-hp. unit, which are understood to produce power at a direct cost of 0.6c per k.w.h., or less than one-third that of purchased power.



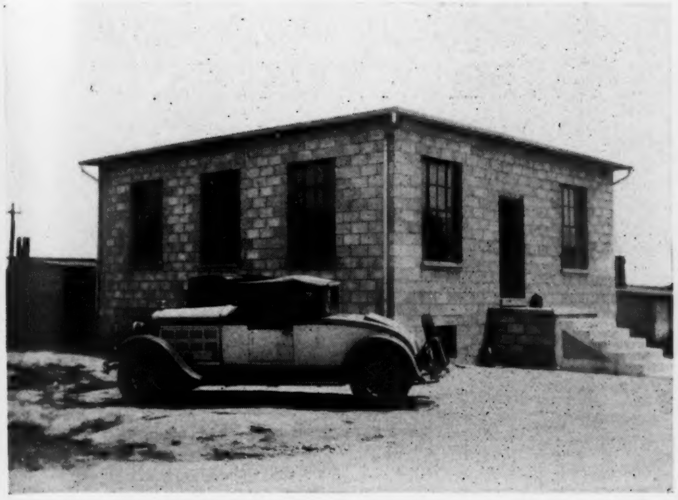
Scalping screen and 30-in. primary elevator

Compressed air for the secondary drilling is furnished by an 8½-in. by 9-in. Worthington feather valve air compressor, belt-driven from a 30-hp. Fairbanks-Morse induction motor.

A modern concrete-block office building with basement has been added during the past year, and this has been equipped with a Williams Oilomatic oil-burning boiler

MACHINE	DRIVE	MOTOR
30-in. primary gyratory crusher	Belt	200-hp. Fairbanks - Morse semi-Diesel oil engine.
Drum hoist	Belt	200-hp. Fairbanks - Morse semi-Diesel oil engine.
4-ft. Symons cone crusher	Belt	100-hp. Fairbanks - Morse semi-Diesel oil engine.
10-in. Newhouse crusher	Direct	100-hp. Allis-Chalmers slip-ring motor.
6-in. McCully fine reduction crusher	Texrope	40-hp. Allis-Chalmers slip-ring motor.
Reclaiming pan conveyor, 24 in. x 32 ft.	Geared	3-hp. General Electric, back-geared motor.
Pan conveyor feeder, 36 in. x 6 ft.	Falk reducer	3-hp. Allis-Chalmers slip-ring motor.
30-in. bucket elevator (primary)	Texrope	40-hp. Allis-Chalmers slip-ring motor.
Two 24-in. bucket elevators (to dry screens)	Texrope	40-hp. Allis-Chalmers slip-ring motor.
30-in. bucket elevator (to wet screens)	Geared	25-hp. Allis-Chalmers induction motor.
Webster sand box	Belt	5-hp. General Electric, back-geared motor.
Morrow sand box	Belt	5-hp. Fairbanks-Morse, back-geared motor.
Eleven 4-ft. x 8-ft. double-deck screens	Texrope	5-hp. Allis-Chalmers induction motor (each).
One 4-ft. x 8-ft. triple-deck screen	Texrope	7½-hp. Allis-Chalmers induction motor (each).
Three 4-in. centrifugal pumps (washing)	Direct	40-hp. Allis-Chalmers induction motor (each).
One 6-in. centrifugal pump (drainage)	Direct	20-hp. Fairbanks-Morse induction motor.
One 6-in. centrifugal pump (drainage)	Direct	25-hp. Fairbanks-Morse induction motor.
Air compressor	Belt	30-hp. Fairbanks-Morse induction motor.

Gyratory 10-in. crusher with spouts to 4-ft. cone crusher in foreground



The office of C. C. Beam, Inc., Melvin, Ohio, is a concrete building with well arranged interior

for hot water heating, and a Milwaukee air-lift water system.

The officers of the company are: C. C. Beam, president and general manager; W. V. Curtis, vice-president; Alice C. Beam, secretary-treasurer; Harry Brandon, sales manager, and P. F. Beam, superintendent.

Belle Hallock Colgan

THE WIDOW of the late Frank J. Colgan, Mrs. Belle Hallock Colgan, 47, died May 30 at her home in Columbus, Ohio. Since the death of her husband two years ago, Mrs. Colgan has directed the business of the Colgan Limestone and Products Co., of which she was owner.

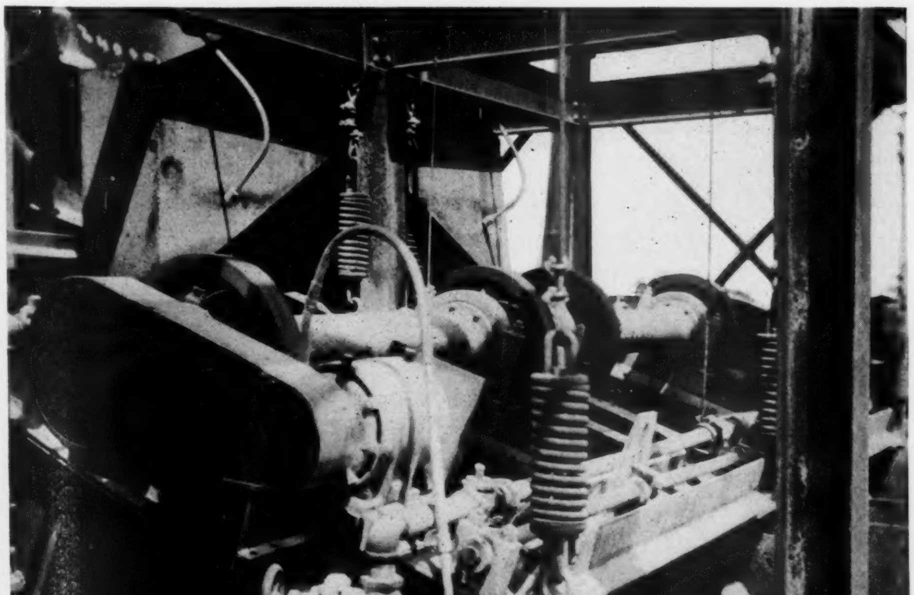
Although born in Dunkirk, N. Y., she lived nearly all her life in Columbus, says the *Columbus* (Ohio) *Post-Dispatch.*

Building Industry Investigations

THE FEDERAL Trade Commission recently has undertaken an investigation of the building material industry. Preliminary work is now under way and will be prosecuted at several different points.

In this inquiry the commission will investigate and report facts relating to the letting of contracts for the construction of government buildings, particularly with a view of determining whether or not there are or have been any price-fixing or other agreements, understandings or combinations of interests among individuals, partnerships or corporations engaged in the production, manufacture or sale of building materials with respect to the prices or other terms at or under which such materials will be furnished contractors or bidders for such construction work.

Preliminary work is also under way on an investigation of competitive conditions in the cement industry as authorized by the 71st Congress. The resolution calls for investigation and report as to whether activity in the cement industry on the part of trade associations, manufacturers of cement or dealers in cement constitutes a violation of the antitrust laws.



Two of the six wet sizing screens on top floor of C. C. Beam washing plant.

To Develop Florida Rock Deposits

DEVELOPMENT of large rock deposits along the Hillsborough river and situated about three miles south of Zephyrhills, Fla., will be started as the result of findings now being made by A. E. Hutchinson, assisted by A. H. Chancey, engineer, both of Miami, Fla.

Hutchinson reports that a rock company now operating in Miami and Jacksonville will open a quarry with rock crushing and other rock working machinery to utilize these deposits, and that an initial investment of at least $75,000 would be necessary to equip the plant. A spur track will be built from the Seaboard Air Line railroad, the main line of which from Jacksonville to Tampa is only a short distance west of the proposed development.

Tests made indicate a deposit of silica, or flint rock, many acres in extent and about 20 ft. deep, with an unknown depth of limestone below.

The silicate is of two kinds—one so very hard that crushing is the only method of working it, and another softer silicate that can be sawed into slabs and blocks for building and ornamental purposes. Chemical analyses have shown the softer silicate to be 96% silica and the harder one 90% silica.

The company that will quarry, mill and market these rock deposits is adequately financed by the parent company, and will have a local character so that it can carry the name "Zephyrhills" in its title.

Gypsum and Gypsum Products Manufacture—Part X

The Chemical Analysis of Gypsum

By S. G. McAnally

Chief Chemist, Giant Portland Cement Co., Egypt, Penn.; formerly Chemist for the Pacific Portland Cement Co., Mound House, Nev., and Chemist and Superintendent for the Standard Gypsum Co., Ludwig, Nev.

Abstract

THIS ARTICLE is a resumption of a series begun in the July 5, 1930, issue. Installment IX was published in the April 11, 1931, issue.

The present installment deals with the chemical end of the work of a gypsum products plant laboratory—particularly with the determination of anhydrite.—The Editor.

IN THE GYPSUM PLANT LABORATORY the usual determinations made on the raw and the calcined gypsum are for: Combined water, calcium carbonate and sulphur trioxide. Calcium carbonate is common and is the predominating impurity (not including anhydrite) in most gypsums. Few gypsums contain argillaceous material and magnesia in appreciable quantities to require separate determinations. The principal estimations in the raw material are the percentages of gypsum ($CaSO_4 \cdot 2H_2O$), anhydrite ($CaSO_4$), calcium carbonate ($CaCO_3$), other impurities are estimated by difference.

It is not the intention to describe analytical methods for the complete analysis of gypsum and gypsum products; these are to be found in standard works. However, some suggestions are offered regarding methods of preparing the samples, especially of raw gypsum, and the drying and ignition temperatures, which are all important, in order to arrive at a correct estimation of the double hydrate and the anhydrite.

Determination of Combined Water in Raw Gypsum

If the sample is wet or damp it should be heated in an open drying oven at a temperature not to exceed 100 deg. F, until it *appears* dry. Finely grind a portion of the partially dried sample and dry it in a closed oven for one hour at 155 deg. F. or two hours at 135 deg. F. Transfer the dried sample to a stoppered bottle and place it in a desiccator to cool. Heat 1 g. of the dried sample in a crucible for four hours at 500 deg. F., or two hours at 600 deg. F., or one hour at 700 deg. F. Cool and weigh for loss of combined water. Anyone of the three schemes may be followed, but the first two are preferred. The percentage of combined water multiplied by 4.778 equals the percentage of gypsum ($CaSO_4 \cdot 2H_2O$) in the sample. Table A will be found useful for converting combined water to $CaSO_4 \cdot 2H_2O$.

Estimation of Anhydrite

The estimation is calculated from the results of the sulphur trioxide (SO_3) and the combined water determinations and according to the following equations:

I. % $SO_3 \times 1.7006$ (or $BaSO_4 \times 0.58327$) = Total $CaSO_4$.

II. % $CaSO_4 \cdot 2H_2O$ — % combined water = $CaSO_4$ in $CaSO_4 \cdot 2H_2O$.

I. minus II. equals % anhydrite in sample.

There has been some controversy on the accuracy of this method of estimating the anhydrite, and it is claimed that different analysts have obtained variations as great as 7% on the same sample of gypsum. However, the estimation is based on the percentages of the combined water and sulphur trioxide (or calcium sulphate) in the sample. If the latter determinations and the subsequent calculations are made accurately, the anhydrite must be correct. But if the actual determinations are inaccurate, then the calculated percentage of anhydrite will be too high or too low, depending on the nature of the error in the analysis.

The statement that "there is no good method for the determination of anhydrite" can only be admitted when it is qualified by a clause ascribing the inaccuracy of the method to lack of good methods for determining combined water and sulphur trioxide in gypsum. The standard method of determining sulphur trioxide is dependable; the accuracy depends on the analyst. The variation in the methods used by different chemists to determine the combined water is chiefly responsible for the above quoted statement. High drying temperatures should be avoided; high ignition temperatures decompose some of the calcium carbonate that is usually present in gypsums; they also cause the gypsum to "boil" with consequent loss of some of the very finely divided material even when the crucible is covered. The maximum temperature should not exceed 800 deg. F. in order to prevent liberation of carbon dioxide.

Anhydrite Determination Important to Cement Chemists

The estimation of the anhydrite in gypsum is important in the portland cement industry, yet only a few cement laboratories make it. The failure of the majority to do so is not because the anhydrite is generally considered an efficient retarder for cement—opinions differ on this matter—but even at plants whose chemists hold the negative opinion, the anhydrite is not usually estimated.

As a rule, the gypsum is purchased on a minimum sulphur trioxide content, and if car samples meet the purchase specification the gypsum is considered satisfactory. On

TABLE A—FOR CONVERTING H_2O TO $CaSO_4 \cdot 2H_2O$

											Difference	
% H_2O	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	% H_2O	$CaSO_4 \cdot 2H_2O$
11	52.56	53.04	53.51	53.99	54.47	54.95	55.42	55.90	56.38	56.86	0.01	0.05
12	57.34	57.81	58.29	58.77	59.25	59.73	60.20	60.68	61.16	61.64	0.02	0.10
13	62.11	62.59	63.07	63.55	64.03	64.50	64.98	65.46	65.94	66.41	0.03	0.14
14	66.89	67.37	67.85	68.33	68.80	69.28	69.76	70.24	70.72	71.19	0.04	0.19
15	71.67	72.15	72.63	73.10	73.58	74.06	74.54	75.01	75.49	75.97	0.05	0.24
16	76.45	76.93	77.40	77.88	78.36	78.84	79.31	79.79	80.27	80.75	0.06	0.29
17	81.23	81.70	82.18	82.66	83.14	83.62	84.09	84.57	85.05	85.53	0.07	0.33
18	86.00	86.48	86.96	87.44	87.92	88.39	88.87	89.35	89.83	90.30	0.08	0.38
19	90.78	91.26	91.74	92.22	92.69	93.17	93.65	94.13	94.60	95.08	0.09	0.43
20	95.56	96.04	96.52	97.00	97.47	97.95	98.43	98.91	99.38	99.86	......	......
	Percentage of gypsum, $CaSO_4 \cdot 2H_2O$.											

the basis of a specification that covers a minimum of 42% SO_3, a gypsum which contained 10% of impurities and no anhydrite would be subject to rejection, whereas a gypsum which contained 15% impurities and 20% anhydrite would meet the specification. The logical specification should be based on a minimum per cent. of gypsum, $CaSO_4 \cdot 2H_2O$. The shipper's and the consumer's analyses may differ considerably due to causes stated above. To get around this difficulty a method of interpreting the analysis in order to arrive at an approximate composition of the gypsum is suggested.

The maximum SO_3 content in pure gypsum is 46.50%. In gypsums containing no anhydrite, the percentage of SO_3 is lowered in proportion to the increase in the amount of other impurities. These other impurities can be determined accurately. A chart similar to Table B can be used for comparing the actual SO_3 in the sample with the maximum as shown in the table. If the actual exceeds the maximum, then the sample contains anhydrite. The percentage of the latter may be estimated, approximately, by the formula:

Anhydrite = % impurities × 3.778 + % SO_3 in sample × 8.123 -- 377.8; and, 100 — impurities — anhydrite = $CaSO_4 \cdot 2H_2O$ (gypsum).

TABLE B—FOR DETERMINING PERCENTAGE OF ANHYDRITE IN GYPSUM SAMPLES

Impurities in sample (not anhydrite)	Mamixum SO_3 from $CaSO_4 \cdot 2H_2O$	Maximum factor
0.0%	46.50%	12.30
1.0	46.04	12.17
2.0	45.57	12.05
3.0	45.11	11.93
4.0	44.64	11.81
5.0	44.18	11.68
6.0	43.71	11.56
7.0	43.25	11.43
8.0	42.78	11.31
9.0	42.32	11.19
10.0	41.85	11.07
11.0	41.39	10.94
12.0	40.92	10.82
13.0	40.46	10.70
14.0	39.99	10.58
15.0	39.53	10.45
16.0	39.06	10.33
17.0	38.60	10.20
18.0	38.13	10.08
19.0	37.67	9.96
20.0	37.20	9.84

Example—A sample of gypsum contains 42.0% SO_3, 11.0% $CaCO_3$, 2.0% silica and 2.0% iron oxide and alumina. Therefore, the impurities equal 11.0 + 2.0 + 2.0 = 15.0%. According to the table, the maximum SO_3 for 15% impurities is 39.53%; therefore the sample contains anhydrite. Applying the formula:

% impurities × 3.778 + % SO_3 in sample × 8.123 — 377.8
equals 15.0 × 3.778 + 42.0 × 8.123 — 377.8
equals 56.67 + 341.17 — 377.8 = 20.04
therefore: Anhydrite in sample equals 20.04%
and gypsum ($CaSO_4 \cdot 2H_2O$) sample equals (100.0 — 15.0 — 20.04) or 64.96%.

The table may also be used in conjunction with the formula:

$$\% \text{ anhydrite equals } \frac{(P - M)\ (100 - I)}{F}$$

in which P equals the percentage SO_3 in the sample.
M equals the maximum SO_3 given in column 2.
F equals a factor for each maximum, column 3.
I equals the percentage of impurities (not anhydrite) in the sample, column 1.

Anhydrite may be determined in single-boil stucco by making a pat of the plaster, allowing the set plaster to attain constant weight at room temperature, and analyzing the set material as described for raw gypsum.

The estimation of natural anhydrite in double-boil plaster by the above method gives results that are usually too high. This product usually contains an appreciable amount of dead-burned gypsum which is not completely hydrated when it is mixed with water.

Determination of Retarder Content

It is often desirable to know the amount of retarder in samples of retarded hardwall which set either too quick or too slow. Calcined gypsum (solution) is neutral to the indicator phenolphthalein; commercial retarder is strongly alkaline, and its solution gives the characteristic pink color when tested with a few drops of the the above indicator. This color test is applied for the detection of the retarder in gypsum plaster, and the test can be made quantitative if the plaster has not been mixed with lime. The following method of making the determination gives satisfactory comparative results:

Prepare a standard solution of hydrochloric acid, about two-fifths normal strength, by adding 40 cc. of the concentrated acid to one litre of distilled water. Next prepare a stock solution of the phenolphthalein made by adding 50 cc. of a 1% alcoholic solution of the indicator to 3 litres of water. A standard sample of plaster, made by mixing a convenient quantity (200 or 300 g.) of stucco with sufficient retarder to make a normal plant mix, is used for standardizing the acid solution and for making parallel tests with the samples to be tested for retarder.

To standardize the acid, weigh 20 g. of the standard sample into a 250-cc. beaker and add 100 cc. of the *hot* solution of phenolphthalein. Stir the mixture with a glass rod, heat to boiling and boil for three minutes. Titrate at once with the standard acid until the pink color first disappears. Note the number of cc. of acid used. If the standard sample contained x lb. of retarder per ton, and y cc. of acid were used to neutralize the 20 g., then $\frac{x}{y}$ equals the value of 1 cc. of acid in terms of pounds of retarder per ton. If the standard sample contained 9 lb. retarder per ton, and 3.0 cc. of acid were used to neutralize a 20-g. sample, then 1 cc. of acid equals 3 lb. of retarder per ton on a 20-g. sample.

The samples to be tested are treated in the same manner as above described. The cc. of acid used multiplied by the acid value gives the pounds of retarder per ton in the plaster. After the first neutral point has been reached by the addition of the acid, the pink color will gradually return to the mixture; but for practical purposes the first neutral stage should be taken as the end point in order to obtain concordant results. The standard acid may be of a strength to suit individual preference, and it should be standardized against each new shipment of retarder when the latter is being used.

(To be concluded)

Gypsum, Lime and Alabastine, Ltd., Reports Sales Increase

IT IS UNDERSTOOD that Gypsum, Lime and Alabastine, Ltd., Canada, sales for the four months ended April 30 show some small reduction as against the same period last year. April sales, on the other hand, show an increase of about 12% over the same period last year and it is understood that May business was booked in satisfactory volume. The company's cash position, it is stated, is stronger than at the end of 1930 and provision has already been made for certain capital expenditures at Beachville whereby cost of quarrying will be reduced approximately 30c per ton on a total production of 350,000 tons per annum at that plant. The company is also using its cash position to acquire at low prices substantial amounts of its bonds in advance of its sinking fund requirements. Sales of the company's new lines are reported as progressing satisfactorily—*Toronto* (Ont.) *Star.*

A. S. T. M. Exhibits Special Apparatus

VISITORS to the A. S. T. M. Exhibit of testing apparatus and machines which is to be held June 22-26 at Chicago, Ill., will be interested in seeing just how small testing machines can be and still effectively determine certain data.

Among the machines on exhibit will be a machine designed for fatigue tests on specimens 1/500 in. in diameter; apparatus shown by A. S. T. M. Committee C-5, which offers a very unique method of measuring the fire resistance of wood, especially to the spread of flame; and a fatigue testing machine for sheet metals.

In addition to the equipment mentioned above, there will be many other pieces of equipment of special design and use, not produced commercially, which should attract technical men.

Effect of Sulphur on Portland Cement Mortar

By Miles N. Clair
Vice-President, The Thompson & Lichtner Co., Inc., Boston, Mass.

FREE SULPHUR is not one of the usual "deleterious" compounds found in materials used for concrete and therefore very little information is available in technical literature in regard to its effect on concrete. Under special conditions, however, free sulphur may occur in either the aggregates or the water used to make concrete.

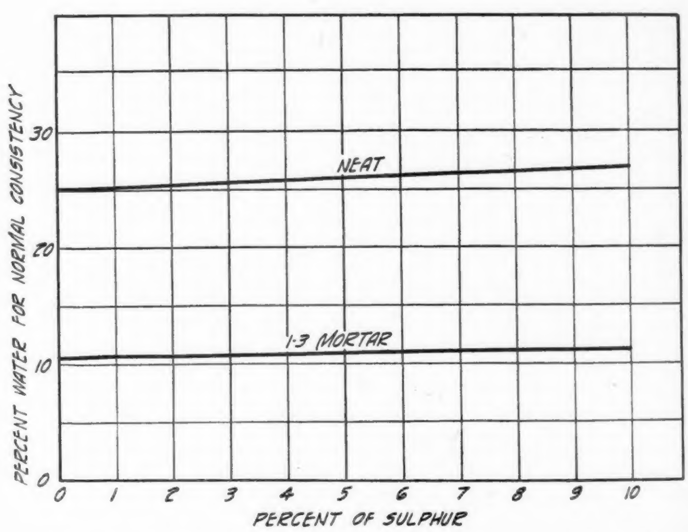
There are reported in this article data from tests made during 1928 and 1929 to obtain some information on this subject. The tests included neat cement briquet tests, standard mortar briquet tests and compression tests of 2 in. diameter by 4 in. high standard mortar specimens. The specimens were made with several percentages of powdered sulphur and were broken at various ages up to one year. The standard A. S. T. M. methods for testing portland cement were used throughout in making the specimens. The specimens were stored in water at 75 deg. F. The water content of the specimens was changed as the sulphur content increased, so as to maintain the normal consistency. No tests were made on specimens of concrete, as the effect on the mortar was considered as indicative of what might be expected in concrete.

The data are given in the tables that follow and have also been plotted for ease of study.

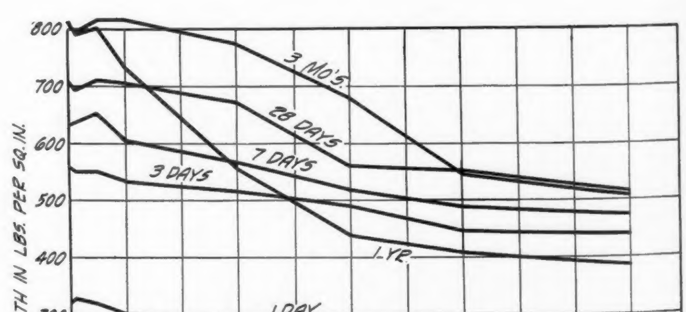
The effect of various percentages of sulphur is practically the same for the briquet tests as for the compression tests. There

Effect of Sulphur on the Strength of Neat Briquets

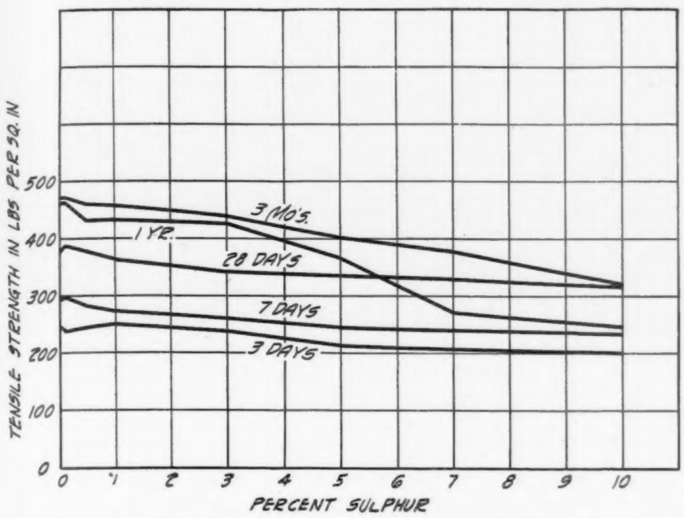
Series	Per cent. sulphur	Water content	1 day	3 days	7 days	28 days	3 mos.	1 year
S1A	0	25.0%	300	540	660	660	830	845
			340	575	610	720	820	785
			325	560	635	730	780	795
			322	558	635	703	810	812
S2A	.1	25.0	350	580	615	730	830	820
			325	520	620	660	790	760
			310	555	680	695	765	800
			328	552	638	695	795	793
S3A	.5	25.1	350	590	620	720	810	840
			300	520	660	680	860	770
			310	545	680	740	790	795
			320	552	653	712	820	803
S4A	1.0	25.2	280	520	580	690	840	740
			330	560	640	720	780	760
			295	525	605	710	850	705
			302	535	608	707	823	735
S5A	3.0	25.6	310	505	600	690	740	[illegible]
			265	540	550	710	810	600
			280	510	555	620	780	560
			285	518	568	672	777	557
S6A	5.0	26.0	290	490	500	600	750	470
			310	520	550	540	660	410
			260	470	510	550	630	435
			288	493	520	563	680	440
S7A	7.0	26.4	240	455	495	580	620	410
			275	485	460	530	520	440
			235	440	520	550	510	380
			250	447	492	553	550	410
S8A	10.0	27.0	215	465	460	490	540	360
			250	420	455	560	510	385
			240	435	510	490	480	415
			235	440	475	513	510	387



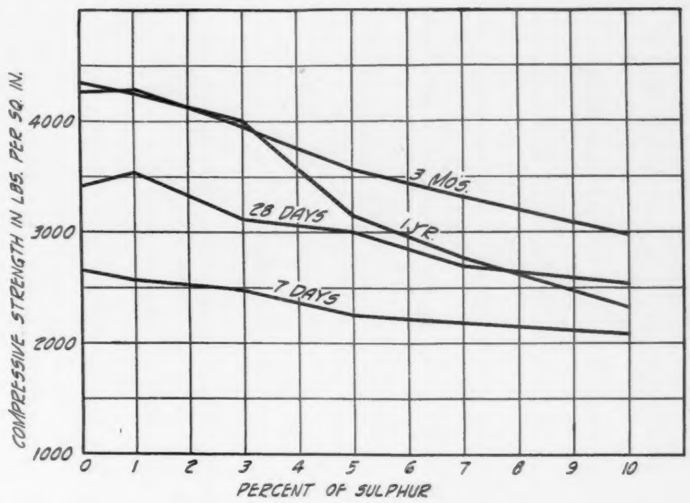
Effect of sulphur on amount of water for normal consistency



Effect of sulphur on strength of neat briquets



Effect of sulphur on strength of standard 1:3 mortar briquets



Effect of sulphur on strength of 2x4-in. cylinders of standard 1:3 mortar

Effect of Sulphur on the Compressive Strength of Standard 1:3 Mortar Briquets

Series	Per cent. sulphur	Water content	3 days	7 days	28 days	3 months	1 year
S1B	0	10.7%	250	310	390	470	440
			230	280	370	490	460
			260	290	365	455	480
			247	293	375	472	460
S2B	.1	10.7	255	300	400	490	480
			220	310	390	455	445
			240	285	360	470	480
			238	298	383	472	468
S3B	.5	10.7	260	270	380	480	440
			240	300	400	470	410
			235	290	350	430	440
			245	283	377	460	430
S4B	1.0	10.75	260	270	370	480	420
			250	290	350	450	450
			240	255	375	445	430
			250	272	365	458	433
S5B	3.0	10.85	220	250	360	440	430
			245	280	340	460	440
			250	260	330	430	405
			238	263	343	443	425
S6B	5.0	10.95	225	265	340	420	350
			200	240	350	390	370
			220	235	325	405	375
			215	247	338	405	365
S7B	7.0	11.05	220	260	325	405	280
			200	240	320	370	255
			205	230	350	360	280
			208	243	332	278	272
S8B	10.0	11.20	190	250	310	330	265
			220	230	310	290	220
			190	225	325	340	240
			200	235	315	320	248

Effect of Sulphur on the Compressive Strength of Standard 1:3 Mortar

Series	Per cent. sulphur	Water content	7 days	28 days	3 months	1 year
S1C	0	10.7%	2440	3180	4050	4220
			2880	3660	4480	4480
			2660	3420	4265	4350
S2C	1	10.75	2440	3420	4550	4050
			2680	3660	4020	4460
			2560	3540	4285	4255
S3C	3	10.85	2290	3280	4280	4240
			2670	2960	3620	3720
			2480	3120	3950	3980
S4C	5	10.95	2440	3180	3760	3260
			2080	2820	3380	3080
			2260	3000	3570	3170
S5C	7	11.05	2080	2840	3520	3060
			2290	2520	3140	2480
			2185	2680	3330	2770
S6C	10	11.20	2080	2680	3220	2080
			2080	2360	2820	2560
			2080	2520	2970	2320

is a gradual falling off of strength with increasing sulphur content at all ages up to three months. At the one year period, the decrease in strength with sulphur content is very rapid except for the compression tests, where the decrease in strength does not start until there is more than 1% of sulphur present. None of the specimens in these tests showed any sign of cracking or disintegration.

The data showing the percentage of water required for normal consistency with various sulphur contents is valuable if it is desired to apply a correction for the change in water-cement ratio. The change in the water-cement ratio, however, is sufficient to account for only a small part of the change in strength with increase of sulphur content. There is a slow chemical action due to the sulphur, the effect of which becomes very apparent only at ages over the usual 28-day test period.

It must be concluded that the presence of free sulphur in materials used for making concrete is objectionable, particularly where it exceeds 1% by weight of the cement.

Chemical Exposition

IT IS REPORTED that more than 103,000 visitors viewed the displays of some 360 exhibitors at the 13th Exposition of Chemical Industries held in New York May 4-9.

There were many exhibits of machinery and equipment which serve the rock products industry. Also of interest was a new quick-setting, chemically resistant cement having a tensile strength in 24 hours of 1700 lb. of fused silica, hard rubber and glass.

The process of combining two important plant foods into a readily drillable fertilizer by spraying superphosphate with ammonia was demonstrated and explained by fertilizer specialists of the Bureau of Chemistry and Soils, U. S. Department of Agriculture. Also of interest were four different methods of applying the hydrogen impotential (ph) test. These exhibits reflect the growing interest and attention being given the development of fertilizers in this country.

Hints and Helps for Superintendents

Quick Changing of Hammer-Mill Screens

By J. Gilmore Wilson
General Superintendent, Warner Co., Devault, Penn.

TWO OR THREE YEARS AGO we had a very high-speed machine working at Cedar Hollow, which was manufactured by the Pulverizing Machinery Co. of Elizabeth, N. J. Of course, fine grinding requires fine screens and when you have a fine screen it means a thin metal in the screen. Consequently, the head of an 8-penny nail would wreck a screen plate. The manufacturer had a device that he considered very good and which would be extremely satisfactory if the screen had to be replaced once or twice a year. The mill did extremely good grinding, but we would be puncturing a couple of screens every day. It always required one hour of good fast work with two men to renew it. I considered it a shame that such a condition should take place. So this got me to thinking about a device which I later had patented.

The description of the device, based on the patent specifications, is as follows: An object of the invention is to provide machines of the class specified with a detachable bottom, so that the discharge screens can be removed without disassembling the machines.

Another object is to provide pulverizing machines with a discharge screen retaining frame that is suspended from the bottom of the machines in such a way that the frame can be dropped to permit removal and replacement of the screen.

Another object is to produce an efficient, strong and durable pulverizing machine which may be economically constructed and operated.

The views of the drawings are: Fig. 1 is an elevation of a hammer mill constructed according to my invention; Fig. 2 is a view similar to Fig. 1, partly in section, the screen and its supporting frame being shown in a lowered position to permit removal of the screen from the machine; Fig. 3 is a plan of the screen supporting frame; Fig. 4 is a perspective of the screen; Fig. 5 is a detail vertical section as seen from the line 5—5 of Fig. 1, and Fig. 6 is an elevation, partly in section, of a portion of a hammer mill equipped with a grid screen.

Suspended beneath the base 10 is a frame 20. The upper portion of this frame is formed with an outwardly projecting flange 21, which is secured to a flange 22 formed on the bottom of the base 10, by means of bolts 23.

The lower surface of the longitudinal sides of the frame 20 are curved in the manner illustrated so as to provide the sides of the bottom of the frame with an irregular contour including parallel central depending circular portions 24, and parallel reversely curved outer portions 25.

Disposed beneath the frame 20 is another frame 26, the upper longitudinal edges of which are shaped to conform to the contour of the bottom edges of the frame 20.

The frame 26 is suspended from the base 10 by means of bolts 27, depending from the flanges 22.

The bolts 27 are passed through perforated lugs 28 formed on the opposite longitudinal side walls of the frame 26, the shanks of the bolts projecting a considerable distance below the bottom of the frame 26 and having threaded thereon nuts 29. The nuts are screwed up the bolts sufficiently to bear against the under faces of the lugs 28, and thereby retain the frame 26 in position beneath the frame 20.

The purpose of the frame 26 is to support a perforated sheet metal plate, constituting a screen 30. This screen is clamped between the adjoining edges of the frames 20 and 26, in the manner illustrated by Fig. 5.

Each end of the frame 26 has integrally formed therewith, outwardly extending ribs 31.

Suspended beneath the base 10, and disposed adjacent to the ends of the frame 26, are Z-bars 32, having inwardly projecting lower flanges 33 disposed beneath the ribs 31 (see Fig. 1).

The arrangement of the parts is such that the bottom of the machine is unobstructed, and therefore the frame 26 can be lowered to permit removal of the screen without disassembling the machine.

When it is desired to remove the screen for any purpose, such as for repairing or replacement, the nuts 29 on one side of the frame 26 can be unscrewed from the bolts 27, and the bolts withdrawn, thus, leaving the frame supported only by the bolts on one side of the machine.

The nuts on the bolts on the side of the frame opposite to that from which the bolts have been removed are now unscrewed sufficiently to permit the frame 26 to drop

Fig. 1.

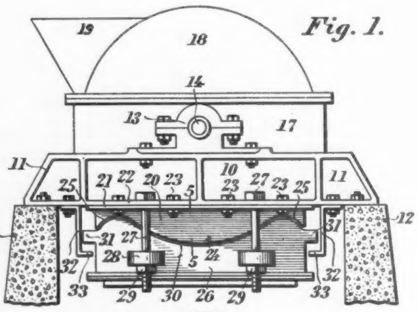
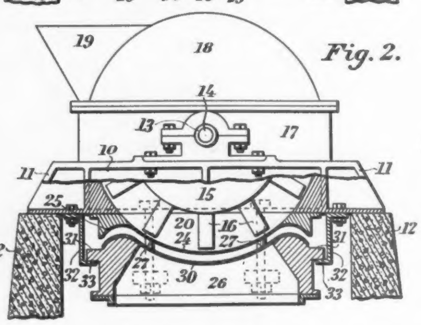


Fig. 2.



Sectional elevation of hammer mill

Fig. 3.

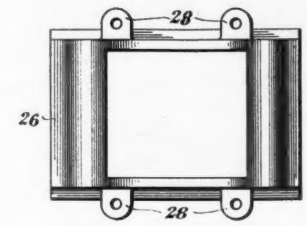


Fig. 4.

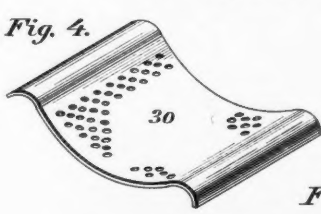
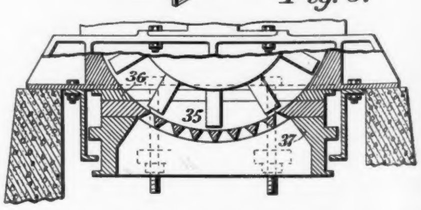


Fig. 5.

Fig. 6.



Details of units which facilitate quick changing of hammer-mill screens

down until the ribs 31 rest on the inturned flanges 33 of the angles 32.

The screen 30 can be readily removed through the space provided between the frames 20 and 26, and a new screen can be inserted.

The bolts which were removed are now replaced, and the nuts screwed up on all of the bolts. This action will force the screen 30 up against the frame 20, and due to construction of the adjacent edges of the frames 20 and 26 the screen will be clamped firmly in position, as will readily be understood.

In the form of the invention shown in Fig. 6, a grid screen 35 is disposed between the bottom surfaces of a frame 36 suspended from the base 10, and the upper flat surface of a frame 37 functioning in a manner similar to the frame 26 heretofore described. Aside from altering the contours of the adjacent surfaces of the frames 36 and 37 so that such frames will conform to perimeter of the grid screen 35 no other changes need be made in constructing this form of the invention.

Don't Do It!

THE ILLUSTRATION shown was taken in a western sand and gravel plant. Perhaps the owner will recognize the setting and if he does probably will put a stop to

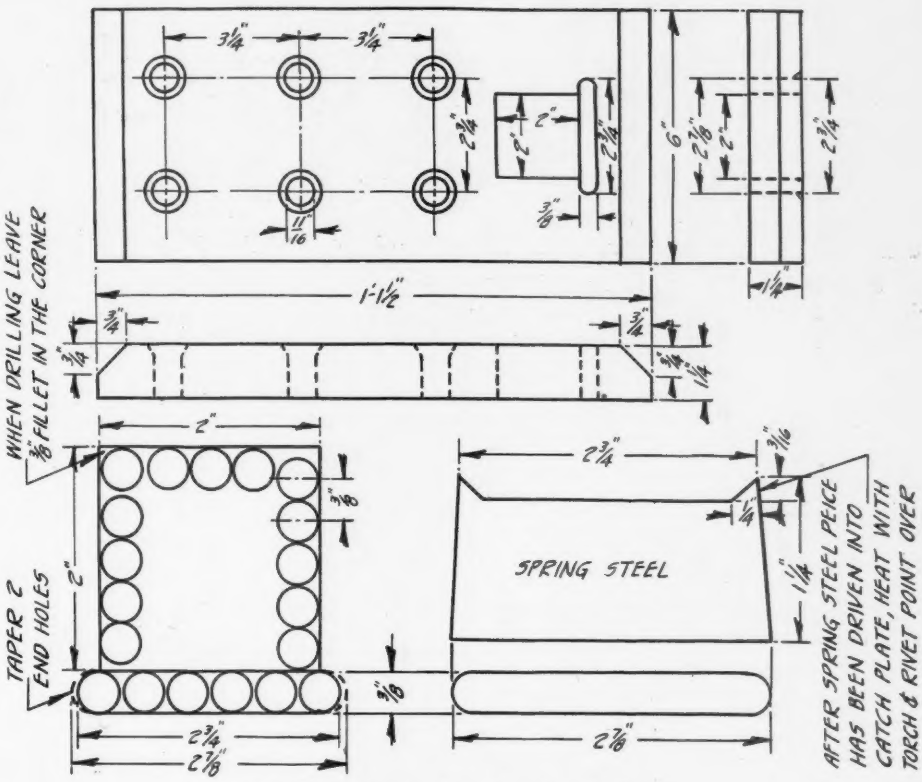
Dangerous practice

the practice of workmen riding a belt conveyor in his plant. Of course if one is clever, it's perfectly safe to ride a belt, in fact you are too clever to work in a sand and gravel plant, and the boss should tell you so.

Homemade Shovel Dipper Latch Plate

By C. H. Wright
Snyder, N. Y.

ON BOTH OUR SHOVELS we have had nearly every sort of a latch plate made, manganese cast steel, last but not least. The accompanying drawing shows a latch plate made up of a piece of steel plate 1¼ in. thick, 6 in. wide and 13½ in. long. The fundamental principle of



Details of latch plate for shovel dipper

this plate is that when it is bent it can be heated and straightened and put into service again. It is very inexpensive because there is not a plant in the country, connected in any way with quarry operation, that does not have more or less of such material on hand. Simply get a plate shaped for length and breadth, taking for granted the plate is 1¼ in. thick. Lay out the latch bar hole first, 2 in. square, then follow up with the 11/16-in. holes for ⅝-in. rivets, being sure to counter-sink these holes rather deep so the heads of the rivets cannot be easily worn off, causing the plate to work loose on the dipper, which causes plenty of trouble when once this happens. This causes the dipper to dump hard, and more than that, wears out the rivet holes in the dipper shell, making this section weak and oftentimes causing the dipper shell to crack at this point.

The main principle in regard to this latch plate is the small spring steel plate, that is fastened at the bottom of the latch bar hole. Just how this is fastened in I will explain a little later. The reason I use spring steel is that its wearing qualities are very near equal to that of manganese and it is very easily worked into shape before forcing into latch plate.

After having all the holes laid out, the first two holes I drill are the two ⅜-in. outside holes at the bottom of the latch plate. The manner in which I taper this slot for the steel wearing plate is to use a piece of ¾-in. angle-iron, ⅛ in. thick, and to put it on under the latch, before drilling, and that gives the right taper to the hole. I use angle-iron because I can hold it just where I want it.

Care should be considered in this simple but important part, being sure to have the longest side of this tapered hole on the same side that the 11/16-in. holes are counter-sunk on. For this one reason most every latch plate is riveted on to the inside of the dipper, and for some reason or other, the latch bar does not always work just as it should. Perhaps a stone may be lodged in the latch plate hole made expressly for the latch bar to fit into, or perhaps when the shovel is working in heavy clay bottom this may also pack in the hole, preventing latch bar from entering. The pit men who usually do this kind of work are not always supplied with the best of knowledge pertaining to the mechanical principles of the shovel. The engineer who knows and understands his part of the work relies somewhat on the men under him to assist him. He says, "Tony, see what is wrong with that latch." Tony, without any forethought, hauls off with a sledge and trys to drive the latch bar into place. Perhaps, just at that particular moment, the latch bar just happens to be in the right position to drive this spring steel piece out of the latch plate, if it is not put in from the proper side.

Fit your spring steel piece so that it will go down into its place, say within ½ in. Then heat the latch plate and drive in your spring steel piece and then cool off by dipping it into water.

Before driving in the steel piece, take a half round chisel and make an impression so that the two points may be heated with a torch and riveted over to help hold it in place.

Rock Products Clinic

Is Price-Cutting Ever Justified?

A CONSTANT READER and friendly critic, whose identity we regret not to disclose here, has sent us the following communication. Those sufficiently interested to read another discussion of price-cutting will find it on the editorial page of this issue.

* * *

Why Prices Are Cut

"Mr. Editor: It is common to hear it said, or see it printed, that price-cutting, or selling below cost, is per se a crime, unjustifiable in any case. Let's see why business managers resort to price-cuts. So far as I can observe, individual price-cutting is resorted to (1) to stimulate a greater demand; (2) to obtain a greater volume of production, and hence lower costs of production; (3) to eliminate unwanted competition; (4) through fear that competitors have cut or are about to cut prices; (5) through a general loss of business morale; (6) a belief in the deflationist theory that all prices, wages and costs are coming down, and (7) because the producer is so hard up for cash that he considers he must have cash at any price.

Damned Today but Hailed as a Benefactor Tomorrow

"If the use of a commodity can be greatly stimulated, and hence volume of production increased and costs lowered, it is just and proper to reduce prices, even below present costs. If such a policy had not been followed in the automotive industry, for example, we never should have had as cheap and as good automobiles as we have today. Obviously, such price-cutting, so-called, must begin with some individual manufacturer, and while he may be damned for the time being, he is actually benefitting the industry, and the public, and civilization in the long run.

Must See Larger Market

"But such price-cutting must be predicated on the possibility and probability of developing a larger market. In the case of basic materials such as the rock products, great market expansion is impossible. Customers are few, and the amount of such materials they can use is limited by things or circumstances over which in a great measure they have little control. A cut in the price of cement or aggregates may be a factor in using concrete in place of steel or brick, or asphalt, but it is not a very potent factor in the gross annual demand—only one of many.

"When a manufacturer in one of these industries cuts prices to increase the volume of his own business at the expense of his competitors, unless he is fully justified by appreciably lower costs than his competitors, he is obviously cutting his own throat; or he has the resources and the intent to drive his competitors out of business. This is generally considered an unfair business tactic, and if the intent can be proved, it is actually unlawful. Yet it seems to me in a society which worships individualism and places no restraint on the opening up of unnecessary new plants, there may be some rough justice in this working out of the law of survival of the fittest.

An Example of Protection to the Price-Cutter

"To be explicit, I recently heard a producer tell how in happier days a new competitor had appeared in a pretty well organized community. Like most newcomers he broke into the industry through price-cutting. The older producers ignored these price cuts and continued, of course, to get by far the largest part of the business, because the newcomer's facilities were limited and his business connections not so good. However, the newcomer soon found he did not have to sell much below the others to get all the business he could take care of; and he made money and continued to expand his operations. In other words, his older competitors had inadvertently given him just the protection he needed to get started and become a real factor in the industry.

Sadder and Wiser

"The older producers are now sadder and wiser and are attempting to do what they frankly admit they should have done at the start—cut prices so drastically as to cut the ground out from under this newer and unnecessary competitor. Now, however, some one of them is as liable to fall by the wayside as the newcomer. The question naturally arises why in the interests of society and of industry should we not 'put the screws' on any new and unnecessary competition in any industry? Isn't it fairer than letting things ride until the screws are turned down on all industry because of the unregulated and reckless promotion of new enterprises?

"If the new enterprise has merit, adequate capital and capable management it will survive the test and take the place it has thus earned for itself in the established industry. If the enterprise hasn't these requisites for success, it shouldn't be permitted to survive; it shouldn't be permitted to get a start. Of course we all know that this is the principle and the method by which John D. Rockefeller and the Standard Oil Co. monopolized the petroleum industry. The tendency now, however, is to regard him as a great business organizer who brought order out of chaos. There are people who think that, while we might be paying a little more for gasoline, the petroleum industry and business in general would be far better off today if the Standard Oil Co. had not been disintegrated, and if the same methods to control the industry and prevent the present waste of its resources had been continued.

It Worked, Anyway

"I am not necessarily advocating this method of preventing over-capacity. Obviously, there are many angles to it, moral, legal and others perhaps. But it did work. It did prevent general price wars. And local price wars under this system were generally of short duration. Perhaps it could be practiced today with less ruthlessness, and still be effective. A newcomer should be given a *fair chance*, but he should not be protected through a misconception of the ultimate damage he may do to the industry. The test of his fitness, and the need of his operation, should be stiff but not too stiff for a really worthy and capable candidate.

"We forget easily and quickly. Soon we shall again be hitting the old pace in business. Money will be plentiful, and promoters even more plentiful. We will brook no interference with our 'natural rights' to engage in any business we see fit, whether economically sound or not. There is no possibility of leaving the determination of the economic soundness of a proposed enterprise to a political commission, apparently. Then why not leave its soundness to be determined by the established members of that industry? The test will be costly to them; hence, that in itself will be a safeguard against going to extremes. And in an industry with many small units, perhaps the objections to the Standard Oil Co.'s original methods will not arise.

"Intestinal Stamina" Needed

"For indiscriminate price-cutting because of lack of business morale, or 'intestinal stamina,' there is not much to be said, except that undoubtedly the day will come when the vast army of owners of American industry will rise up and put the management of their business in the hands of men who have such stamina. But we should recognize that there may sometimes be sound business and economic reasons for price-cutting.

"Q. E. D."

Editorial Comment

Logic of Price-Cutting

In our Rock Products "Clinic" this issue is a letter from a constant reader and friendly critic on a very tender subject, namely, price-cutting. At first blush this communication may look like a justification of certain forms, or purposes, of price-cutting. However, we think the writer merely intended "to get a rise" out of someone, editor or reader, and that his argument perhaps may be a trifle facetious. It merely shows the lengths to which a business philosophy of unrestricted individualism may be carried.

We do not progress by going backward. This is an age of co-operation and co-ordination. These are the products of intelligence, forbearance, forethought and planning. Our aim is and should continue to be to dissuade the inexperienced and thoughtless promoter by opening his eyes to the real facts in regard to the industry he proposes to enter. The promoter whose eyes are open and who merely wishes to entice the money of inexperienced and uninformed investors into a hopeless project for his own profit should be dealt with less leniently; but even here exposure of his schemes by an associated, co-ordinated and intelligently directed industry should be more effective than an attempt to ruin his dupes by price-cutting after having allowed him to get a start.

But in any discussion of over-capacity, or over-planting, in all of these rock products industries, we must not overlook the fact that the old established producers themselves have frequently been the worst offenders. Led on perhaps by an excess of optimism, or a desire to conceal profits, producers have all too frequently put back their earnings into more and more productive capacity, where, as conditions have since shown, they would have done better to have paid them out in dividends, or invested them in increasing the efficiency of their existing operations.

The example set by these experienced producers in adding to their productive capacities also was the best selling argument newcomers and promoters had for their entrance into the field. So unless the lessons of the present situation are too easily forgotten, it is to be hoped that the producers of the future who are able to earn large profits will utilize them to better the efficiency of their existing operations, or to buy out their weaker competitors, rather than add to existing productive capacity. Example is far more convincing than precept; no argument about excess capacity is valid unless applied by producers whose experience should have convinced them of its truth.

Present indiscriminate price-cutting in nearly all industries is little less than an epidemic of temporary loss of "guts," to be crude but plain. It is a reversion to the oldest known form of business transaction—barter, where there is no real standard of price or value, where petty bickering and dickering rule. It may be all right and proper in horse trading or the Turkish rug business but most of us thought that such industries as steel, cement, etc., had long ago outgrown such practices. Present price-cutting is almost entirely due to the failure of the producer or manufacturer to stick to a quoted price. It does not make a great deal of difference in the ultimate outcome what the original quotation was.

But this epidemic of fear that the other fellow may get the business at any price, and the constant downward revision of quotations to a single prospect or customer, has thoroughly demoralized nearly every industry. Producers and manufacturers say they have lost all confidence in one another. Why? Merely because their business words, their business honor, if you will, their price quotations, cannot be relied upon any longer. Could there be anything but lack of mutual confidence under such circumstances? It seems to us the situation is not at all really difficult to cure. Merely restore mutual confidence. How? By really sticking to quotations made in good faith, of course.

The other fellow naturally will get some of the business just as he always has and always will—he or his successor in the operation of the plant. We can't see where such tactics keep him from getting a share of the available business and we don't believe anybody else does. The only excuse for such practices is that "everyone else is doing it." But they wouldn't do it if a few had sufficient courage to give an example and stick to their original quotations. Others would then believe and mutual confidence would be restored.

It is well to remember that in the days of barter and dicker the common law was "let the buyer beware." The seller was out to "do" him if he could. The present-day buyer of cut-price commodities may soon be placed in the same predicament. Shrewd buyers know this. The condemnation of price-cutting is so universal and so sincere, despite its general practice at the moment, that we have faith that *all* buyers are not looking for the cheapest buy, but sometimes at least for quality and confidence in the honor and integrity of the seller or producer. To serve such buyers ought to be a worthy ambition, as well as trying to get *all* the business in sight at any price.

We imagine Mr. Ladoo, in his series of articles on "Economics of the Nonmetallic Mineral Industries," now running in Rock Products, will deal specifically with the evils which have crept into sales methods, and will have some definite statements to make. But in a larger way the entire series is in the line of education against uneconomical, destructive and unethical practices. In this present issue, on page 35, Mr. Ladoo paints a true and most discouraging picture of the effect of a price war on the financing and development of a rock products project.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	6- 4-31	95	100	
Alpha P. C. new com.[2]	5-29-31	8	9	25c qu. Apr. 25
Alpha P. C. pfd.[2]	5-29-31	110	120	1.75 qu. June 15
Amalgamated Phosphate Co. 6's 1936[19]	6- 1-31	99	101	
American Aggregates com.[19]	6- 1-31	7	12	75c qu. Mar. 1
American Aggregates pfd.[19]	6- 1-31	65	75	1.75 qu. Apr. 1
American Aggr. 6's w.w.[19]	6- 1-31	65	70	
American Aggr. 6's ex. w.[19]	6- 1-31	63	68	
American Brick Co., sand-lime brick	5- 4-31	....	7	25c qu. Feb. 1, '30
American Brick Co. pfd.	5- 4-31	52¼	57	50c qu. May 1, '30
Am. L. & S. 1st 7's[19]	6- 1-31	95	98	
American Silica Corp. 6½'s[39]	6- 3-31	No market		
Arundel Corp. new com.	6- 2-31	34½	35	75c qu. Apr. 1
Beaver P. C. 1st 7's[20]	5-28-31	90	....	
Bessemer L. & C. Cl. A[4]	5-29-31	18	20	75c qu. May 1
Bessemer L. & C. 1st 6½'s[4]	5-29-31	....	77	
Bloomington Limestone 6's[27]	6- 4-31	57	59	
Boston S. & G. new com.[37]	5-29-31	10	12	30c qu. Apr. 1
Boston S. & G. new 7% pfd.[37]	5-29-31	39	42½	87½c qu. Apr. 1
California Art Tile A[9]	5-28-31	....	5	43¾c qu. Mar. 31
California Art Tile B[40]	5-28-31	....	4	20c qu. Mar. 31
Calaveras Cement com.[35]	5-28-31	....	10	
Caleveras Cement 7% pfd.[35]	5-28-31	....	70	1.75 qu. Apr. 15
Canada Cement com.	6- 2-31	9⅜	9¾	
Canada Cement pfd.	6- 2-31	....	90	1.62½ qu. June 30
Canada Cement 5½'s[34]	5-29-31	....	99¾	
Canada Cr. St. Corp. bonds[34]	5-29-31	87	94	
Canada Crushed Stone pfd.[41]	5-26-31	....	79	
Certainteed Prod. com.	6- 2-31	3½	4	
Certainteed Prod. pfd.	6- 2-31	10	20	1.75 qu. Jan. 1
Cleveland Quarries	6- 2-31	....	60	75c qu. June 1
Columbia S. & G. pfd.	6- 1-31	90	94	
Consol. Cement 1st 6½'s, A[44]	6- 3-31	25	30	
Consol. Cement notes, 1941[23]	6- 3-31	No market		
Consol. Cement pfd.[27]	6- 4-31	10	20	
Consol. Oka S. & G. 6½'s[12] (Canada)	5-30-31	99	101	
Consol. Rock Prod. com.[9]	5-28-31	50c	75c	
Consol. Rock Prod. pfd.[9]	5-28-31	4½	5	43¾c qu. June1,'30
Consol. Rock Prod. units	5-25-31	6	8	
Consol. S. & G. pfd. (Can.)	6- 2-31	....	72	1.75 qu. May 15
Construction Mat. com.	6- 1-31	5	6	
Construction Mat. pfd.	6- 1-31	28	29	87½c qu. May 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[35]	5-28-31	65	70	
Coosa P. C. 1st 6's[27]	6- 4-31	49	52	
Coplay Cem. Mfg. 1st 6's[33]	5-29-31	95	....	
Coplay Cem. Mfg. com.[33]	5-29-31	5	7½	
Coplay Cem. Mfg. pfd.[33]	5-29-31	25	40	
Dolese & Shepard	6- 2-31	40	48	$1 Apr. 1
Dufferin Pav. & Cr. Stone com.	6- 2-31	4	6	
Dufferin Pav. & Cr. Stone pfd.	6- 2-31	71	71½	1.75 Apr. 1
Edison P. C. com.[32]	5-29-31	1½	....	
Edison P. C. pfd.[32]	5-29-31	5	....	
Federal P. C. 6½'s, 1941[19]	6- 1-31	96	100	
General Aggr. Corp. 6½'s[38]	5-29-31	97½	98½	
General Aggr. Corp. com.[38]	5-29-31	9	10	25c qu. July 15
Giant P. C. com.[2]	5-29-31	2	4	
Giant P. C. pfd.[2]	5-29-31	14	19	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.	6- 2-31	7¼	8	20c qu. Apr. 1
Hermitage Cement com.[11]	5-29-31	15	20	
Hermitage Cement pfd.[11]	5-29-31	70	80	
Ideal Cement, new com.	6- 2-31	33	38	75c qu. Mar. 31
Ideal Cement 5's, 1943[29]	5- 2-31	98	100	
Illinois Electric Limestone 1st 7's[38]	5-29-31	95	100	
Indiana Limestone units[27]	6- 4-31	50	60	
Indiana Limestone 6's	6- 1-31	36	36½	
International Cem. com.	6- 2-31	27¾	28	$1 qu. June 30
International Cem. bonds 5's	6- 1-31	81 act. sale		Semi-ann. int.
Iron City S. & G. bonds 6's[36]	5- 2-31	85	....	
Kelley Is. L. & T. new stock	6- 2-31	....	30	62½c qu. Apr. 1
Ky. Cons. St. V. T. C.[38]	5-29-31	4	5	
Ky. Cons. Stone 6½'s[38]	5-29-31	82	88	
Ky. Cons. Stone com.[38]	5-29-31	4	5	
Ky. Cons. Stone pfd.[38]	5-29-31	80	85	1.75 qu. May 1
Ky. Rock Asphalt com.[11]	5-29-31	4	5	40c qu. Oct. 1, '30
Ky. Rock Asphalt pfd.[11]	5-29-31	70	78	1.75 qu. June 1
Ky. Rock Asphalt 6½'s[11]	5-29-31	88	92	
Lawrence P. C.[2]	5-29-31	43	48	$1 qu. June 30
Lawrence P. C. 5½'s, 1942[2]	5-29-31	85½	87½	
Lehigh P. C.	6- 2-31	9¾	10	25c qu. May 1
Lehigh P. C. pfd.	6- 2-31	94	96½	1.75 qu. July 1
Louisville Cement[45]	6- 2-31	175	225	
Lyman-Richey 1st 6's, 1932[13]	5-29-31	95	....	
Lyman-Richey 1st 6's, 1935[13]	5-29-31	92	....	
Marblehead Lime 6's[14]	5-29-31	75	80	
Marbelite Corp. com. (cement products)	5- 2-31	1	....	
Marbelite Corp. pfd.	5-28-31	1	....	50c qu. Oct. 10, '30
Material Service Corp.	6- 2-31	20¼	23	50c qu. June 1
McCrady-Rodgers 7% pfd.[22]	5-29-31	47	....	87½c qu. June 30
McCrady-Rodgers com.[22]	5-29-31	15	20	75c qu. Jan. 26
Medusa Portland Cement	6- 2-31	....	60	75c qu. Apr. 1
Michigan L. & C. com.[6]	5-29-31	45	....	
Missouri P. C.	6- 2-31	21½	22	50c qu. Apr. 30
Monolith Portland Midwest[35]	5-28-31	1	1½	
Monolith P. C. com.[9]	5-28-31	1	2	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	5-28-31	2	3	40c s.-a. Jan. 1
Monolith P. C. units[9]	5-28-31	5	7	
Monolith P. C. 1st Mtg. 6's[9]	5-28-31	73	77	
National Cem. (Can.) 1st 7's[34]	5-29-31	99	....	
National Gypsum A com.	6- 2-31	4	5	
National Gypsum pfd.	6- 2-31	44	46	$1 Apr. 1
Nazareth Cement com.[25]	6- 1-31	....	15	
Nazareth Cement pfd.[25]	6- 1-31	85	....	
Newaygo P. C. 1st 6½'s[27]	5-18-31	101	....	
New England Lime 1st 6's[19]	6- 1-31	40	60	
N. Y. Trap Rock 1st 6's	6- 2-31	96	97	
N. Y. Trap Rock 7% pfd.[30]	6- 1-31	95	....	1.75 Apr. 1
North Amer. Cem. 1st 6½'s	6- 1-31	30	....	
North Amer. Cem. com[27]	6- 4-31	2	4	
North Amer. Cem. 7% pfd.[27]	6- 4-31	16	20	
North Shore Mat. 1st 5's[15]	6- 3-31	90	....	
Northwestern States P. C.[31]	4-18-31	95	....	$2 Apr. 1
Ohio River Sand com.	6- 2-31	....	14	
Ohio River Sand 7% pfd.	6- 2-31	....	98	
Ohio River S. & G. 6's[16]	5-29-31	85	95	
Oregon P. C. com.[9]	5-28-31	8	12	
Oregon P. C. pfd.[9]	5-28-31	80	85	
Pacific Coast Aggr. com.[40]	5-28-31	....	1	
Pacific Coast Aggregates pfd.	5-25-31	2½	3½	
Pacific Coast Cement 6's[5]	5-28-31	64¼	74½	
Pacific P. C. com.[5]	5-28-31	14½	17½	
Pacific P. C. pfd.[5]	5-28-31	58	74½	1.62½ qu. Apr. 4
Pacific P. C. 6's[5]	5-28-31	97	97¾	
Peerless Cement com.[1]	5-29-31	1½	2¾	
Peerless Cement pfd.[1]	5-29-31	40	50	1.75 qu. Apr. 1
Penn.-Dixie Cement com.	6- 2-31	2	2¼	
Penn.-Dixie Cement pfd.	6- 2-31	9⅛	11	
Penn.-Dixie Cement 6's	6- 2-31	55 act. sale		
Penn. Glass Sand Corp. 6's	5- 6-31	100½	102	
Penn. Glass Sand Corp. pfd.	5- 6-31	90	....	1.75 qu. Apr. 1
Petoskey P. C.	6- 2-31	5	6	15c qu. Apr. 1
Port Stockton Cem. com.[9]	5-28-31	No market		
Riverside Cement com.[5]	5-28-31	8½	10¼	
Riverside Cement pfd.[20]	5-28-31	60	65	1.50 qu. May 1
Riverside Cement, A[20]	5-28-31	8	10	15c qu. Feb. 1
Riverside Cement, B[20]	5-28-31	1	2	
Roquemore Gravel 6½'s[17]	5-29-31	98	100	
Sandusky Cement 6½'s, 1931-37[19]	6- 1-31	90	100	
Santa Cruz P. C. com.[5]	5-28-31	85½	90½	$1 qu. Apr. 1
Schumacher Wallboard com.	5- 1-31	8⅛	10	25c qu. Mar. 27
Schumacher Wallboard pfd.	5- 1-31	....	21	50c qu. May 15
Southwestern P. C. units[35]	5-28-31	245	....	
Standard Paving & Mat. (Canada) com.	6- 2-31	7½	8	50c qu. May 15
Standard Paving & Mat. pfd.	6- 2-31	....	69⅞	1.75 qu. May 15
Superior P. C., A[20]	5-28-31	35	36½	27½c mo. June 1
Superior P.C., B[20]	5-28-31	11	13½	25c qu. Mar. 20
Trinity P. C. units[31]	4-18-31	105	....	
Trinity P. C. com.[31]	4-18-31	17½	30	
Trinity P. C. pfd.[27]	6- 4-31	105	....	
U. S. Gypsum com.	6- 2-31	33½	34½	40c qu. June 30
U. S. Gypsum pfd.	6- 2-31	130	133	1.75 qu. June 30
Wabash P. C.[21]	5-29-31	....	21	
Warner Co. com.[16]	5-29-31	22	27	25c qu. July 15
Warner Co. 1st 7% pfd.[16]	5-29-31	85	95	1.75 qu. July 1
Warner Co. 1st 6's[8]	6- 4-31	88	90	
Whitehall Cem. Mfg. com.[30]	6- 1-31	80	....	
Whitehall Cem. Mfg. pfd.[30]	6- 1-31	50	....	
Wisconsin L. & C. 1st 6's[15]	6- 3-31	90	....	
Wolverine P. C. com.	6- 2-31	2	2⅝	15c qu. Nov. 15
Yosemite P. C., A com.[9]	5-28-31	2½	3½	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Beadling & Co., Youngstown, Ohio. [5]Smith, Camp & Co., San Francisco, Calif. [6]Frederic H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois. [16]J S. Wilson, Jr., Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]A. B. Leach & Co., Inc., Chicago, Ill. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher & Co., Denver, Colo. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd. [42]Nesbitt, Thomas & Co., Montreal. [43]Foreman State-National Bank, Chicago. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky.

Monolith Portland Cement Co. Statement

THE ANNUAL financial statement of the Monolith Portland Cement Co., Los Angeles, Calif., contains the following comment and data:

"It was brought out at the annual meeting of the stockholders that the building permits for the year 1930 had fallen off about 25%, and the public works about 30%, under the year 1929, which, combined with the unsatisfactory price situation, produced a shrinkage in gross income for the year.

"We regret the inability to pay dividends on the preferred stock for the year 1930. Conditions are better, but not sufficiently better to state when dividends will be resumed. However, it will be at the earliest possible moment."

FINANCIAL STATEMENT—YEAR 1930—OF THE MONOLITH PORTLAND CEMENT CO.

ASSETS

Cash, accounts and notes receivable		$ 279,196.86
Inventories		288,461.35
Non-current assets and investments		1,532,322.74
Fixed assets—plant and equipment		2,690,717.43
Leasehold on limestone deposits		2,612,623.34
Prepaid and deferred items		110,362.46
Good will and patents		1.00
		$7,513,685.18

LIABILITIES, CAPITAL AND SURPLUS

Current liabilities		$ 226,251.45
First mortgage 6% bonds		958,000.00
Preferred stock outstanding		1,500,000.00
Common stock (no par), stated value		2,247,240.00
Capital surplus		2,345,001.71
Earned surplus		237,192.02
		$7,513,685.18

PROFIT AND LOSS STATEMENT

Net income		$1,720,692.41
Less cost of cement sold:		
Labor, supply and expenses		1,404,800.29
Profits before interest charges, reserves and federal income tax		$ 315,892.12
Deduct:		
Interest charges and amortization of bond discount and expense	$82,616.90	
Provision for depreciation	198,030.92	
Provision for federal income tax	5,000.00	
Provision for reserves	9,000.00	294,647.82
		$ 21,244.30

Comparative Statement

Comparison of net income for the years 1929 and 1930 is given as follows:

	1930	1929
Gross revenue	$1,282,330	$1,349,543
Expenses, depreciation, interest, etc.	1,257,475	1,266,749
Net revenues	$24,855	$62,793
Earned on common	$0.02	$0.52

Number of common shares, 75,960.

Recent Dividends Announced

Alpha Portland Cement pfd. (qu.)	1.75,	June 15
Canada Cement pfd. (qu.)	1.62½,	June 30
General Aggregates Corp. com. (qu.)	0.25,	July 15
International Cement Corp. (qu.)	1.00,	June 30
Lawrence Portland Cement (qu.)	1.00,	June 30
McCrady-Rodgers Co. pfd. (qu.)	0.87½,	June 30
Republic Portland Cement pfd. (qu.)	1.75,	June 1
Warner Co. com. (qu.)	0.25,	July 15
Warner Co. 1st and 2nd pfd. (qu.)	1.75,	July 1

Riverside Cement Defers Preferred Dividend

THE DIRECTORS of the Riverside Cement Co., Los Angeles, Calif., voted (*a*) to defer the quarterly dividend of $1.50 per share due May 1 on the no par value $6 cumulative first preferred stock, and (*b*) to omit the quarterly dividend due about the same time on the Class A participating stock, no par value.

Regular quarterly distributions of $1.50 per share on the preferred were made from August 1, 1928, to and including February 1, 1931. Regular quarterly payments of 31¼c per share were made from August 1, 1928, to and including November 1, 1930, while on February 1 last a dividend of 15c per share was paid on this issue.

Pacific Coast Cement Corp.

THE CONSOLIDATED balance sheet of the Pacific Coast Cement Corp., Seattle, Wash., as of December 31, 1930, is reported as follows:

ASSETS

Property account	$3,615,191
Current assets:	
Cash	61,602
Accounts and notes receivable	62,169
Inventories	293,975
Sinking fund	709
Investments	1,602
Deferred charges, etc.	195,449
Total	$4,230,696

LIABILITIES

*Capital, surplus and reserves	$2,044,194
Funded debt	1,960,500
Current liabilities:	
Accounts payable	91,107
Inter-company accounts payable	105,000
Deferred liabilities	29,896
Total	$4,230,696
Current assets	$417,746
Current liabilities	91,107
Working capital	$326,639

*Represented by 7500 and 100,000 common no par shares.

New York Trap Rock Corp. Statement

A CONSOLIDATED EARNINGS statement of the New York Trap Rock Corp., New York City, for the years 1927-1930, inclusive, is reported as follows:

EARNINGS STATEMENT OF NEW YORK TRAP ROCK CORP.

	Calendar years			
	1930	1929	1928	1927
Net operating profit	*$2,884,294	$3,041,954	$2,742,017	$2,504,261
Other income	60,264	69,241	84,444	38,009
Gross income	$2,944,558	$3,111,196	$2,826,461	$2,542,270
Interest charges	448,272	423,002	470,238	444,828
Provision for depreciation and depletion	509,495	421,661	428,652	352,093
Provision for doubtful accounts	39,375	30,496	....	....
Provision for federal and state taxes	297,992	239,761	274,062	168,059
Other deductions	17,704	6,669	38,501	69,167
Portion applicable to minority stockholders	11,269	....	....	....
Net income	$1,620,451	$1,989,605	$1,615,010	$1,508,123
Previous surplus	3,897,657	2,838,141	1,356,766	†141,252
Credit adjustments	97,668	....	22,033	....
Total surplus	$5,615,776	$4,827,746	$2,993,209	$1,649,375
Dividends on preferred	140,000	140,000	140,000	116,667
Dividends paid minority stockholders	....	....	15,668	175,942
Dividends on common stock	....	540,000	....	....
Loss on plant	....	245,909	....	....
Adjustments	13,014	4,179	....	....
Adjustments, workmen's compensation	30,000	....	....	....
Profit and loss surplus	$5,432,762	$3,897,657	$2,833,141	$1,356,766
Shares common stock outstanding (no par)	180,000	180,000	180,000	180,000
Earnings per share	$8.22	$10.28	$8.31	$6.75

*After deducting selling and general expenses (in 1930, $440,099).
†Adjusted to give effect to changes in capital structure.

Standard Paving and Materials, Ltd.

THE Standard Paving and Materials, Ltd., Toronto, Ont., which operates several sand and gravel plants, reports for the years ended March 31 as follows:

CONSOLIDATED BALANCE SHEET

Assets:	1931	1930
*Fixed assets	$2,173,413	$2,273,730
Patents (cost)	50,000	50,000
Good-will	633,025	633,025
Current assets:		
Cash and call loans	305,599	169,333
Marketable securities	427,635	429,517
Accounts receivable	121,592	330,165
Cash deposited	59,456	55,104
Inventories	48,501	54,160
Cash value life insurance	18,393	10,960
Investments in affiliated companies	70,300	22,560
Deferred charges	60,132	51,873
Organization expense	....	70,240
Total	$3,968,046	$4,150,667
Liabilities:		
Preferred stock	$1,427,500	$1,444,500
†Common stock	105,223	105,223
Subsidiaries' preferred stock	1,082,200	1,102,700
Mortgage payable	28,325	40,648
Current liabilities:		
Accounts payable	56,877	137,770
Federal tax reserve	75,954	68,667
Reserves	66,339	78,946
Capital surplus	....	28,389
Earned surplus	1,125,628	1,143,824
Total	$3,968,046	$4,150,667
Current assets	$ 981,176	$1,049,239
Current liabilities	132,831	206,437
Working capital	$ 848,345	$ 842,802

*After depreciation: 1931, $1,291,115; 1930, $1,108,238. †Represented by 104,872 no par shares.

Warner Co. on $1 Basis

THE Warner Co., Philadelphia,, Penn., has declared a quarterly dividend of 25c on the common stock, placing the issue on a $1 annual basis, against $2 previously, payable July 15 to stock of record June 30.

The company also declared the regular quarterly dividend of $1.75 each on first and second preferred stocks, payable July 1 to stock of record June 15.

Giant Omits Dividend

THE Giant Portland Cement Co., Philadelphia, Penn., has omitted the semi-annual dividend of $1.75 on preferred stock due at this time.

Kelley Island Lime and Transport Co.

THE ANNUAL REPORT of George J. Whelan, president of the Kelley Island Lime and Transport Co., Cleveland, Ohio, contains the following:

"A review of general business conditions which prevailed throughout the year 1930 is unnecessary. The company was affected by those conditions, resulting in a marked decline in earnings, yet, viewed in the light of the business of the major outlets for the company's products, it is felt that the final results make a satisfactory comparison.

"Contrary to the general and much published opinions of those who are usually relied upon in forecasting business, the looked-for improvement failed to materialize, and at the close of the year shipments dropped to the lowest point of which there is any record for many years. A large part of the lime products is consumed by the construction industry, where certain classes of building practically ceased, other classes were curtailed, and the very large state and federal program of public building was so slow in getting started that its effect was not felt in 1930. In the steel industry, where so much of the crushed-stone products are used, operations throughout the year were maintained at a low level, and their requirements of fluxing stone were correspondingly low. Other markets for products were similarly affected.

"The net profit for the year amounted to $515,210.45 after deduction of all charges, including depreciation, depletion, taxes and federal income tax. The regular dividend at the rate of $2.50 per share for the year was paid, which required using $257,169.55 from earned surplus. The company is in excellent condition, with no debt of any kind, and has a ratio of current assets to current liabilities of 11 to 1. Among the principal assets are large deposits of limestone of proven quality for which there is no indication of any lessening demand in normal business periods.

"During the year 1930 the total outlay for plant improvements, etc., was $319,387.50. The loss of the steamer *George J. Whelan*, with the sale of the steamer *Chisholm*, brought the net outlay for property account down to $120,513.01. Depreciation and depletion charges included in costs for the year amounted to $267,513.82. While the total expenditures for plant improvements, new equipment, etc., was comparatively small, attention was given to changes that will tend to improve products, reduce costs, and broaden the markets for products. The steamer *Kelley Island* was converted into a self-unloading type boat. At the White Rock plant construction of new bulk hydrated lime storage bins was started. The company finished quarrying practically all of the marketable stone from the west side of Kelleys Island, which necessitated making a cut through to the east side and opening of a new quarry where there is sufficient tonnage of stone for many years. Dock property was acquired at Buffalo to aid in the distribution of sand and stone, and many minor improvements were made at the various plants."

BALANCE SHEET—DECEMBER 31, 1930—OF THE KELLEY ISLAND LIME AND TRANSPORT CO.

ASSETS

Current:			
Cash		$ 228,471.24	
U. S. Government securities (at cost)		2,734,632.09	
Notes, acceptances and accounts receivable	$383,254.59		
Less: Allowance for doubtful, etc.	20,000.00	363,254.59	
Inventory (certified by management)		679,200.84	
Dividend receivable (received January 2, 1931)		20,000.00	$4,025,558.76
Investments in stocks and bonds, etc., at cost			410,038.61
Other assets, miscellaneous receivables, etc.			127,383.69
Permanent:			
Land, buildings, machinery and equipment, less allowance for depletion and depreciation			6,496,205.01
Investments in and advances to subsidiary companies			405,514.00
Insurance reserve funds:			
U. S. Liberty bonds and cash funds			243,195.85
Deferred: Prepaid expenses, etc.			19,425.29
			$11,727,321.21

LIABILITIES

Current:		
Accounts payable	$ 37,933.44	
Accrued taxes	122,369.59	
Dividend payable (paid January 2, 1931)	193,095.00	$ 353,398.03
Reserve for fire, liability and boat insurance		243,195.85
Capital stock (no par value)—Authorized, 400,000 shares; issued, 308,922 shares		
Common capital	$7,723,800.00	
Profit and loss—surplus	3,406,927.33	11,130,727.33
		$11,727,321.21

CONDENSED INCOME AND EXPENSE AND SURPLUS ACCOUNT FOR THE YEAR ENDED DECEMBER 31, 1930, OF THE KELLEY ISLAND LIME AND TRANSPORT CO.

INCOME AND EXPENSE

Departmental operating profit, after deducting cost of material sold		$ 983,213.08
Depreciation and depletion on plants and property		267,513.82
Gross profit		$ 715,699.26
Selling, administrative and general expenses		290,443.39
Operating profit		$ 425,255.87
Other income, including income from investments, interest earned, etc.	$155,766.56	
Less: other deductions	18,023.47	137,743.09
Profit before providing for federal taxes		$ 562,998.96
Provision for federal taxes		47,788.51
Net profit transferred to surplus		$ 515,210.45

PROFIT AND LOSS—SURPLUS

Balance December 31, 1929	$3,664,096.88
	$4,179,307.33
Less: Dividends—$2.50 per share	772,380.00
Profit and loss—surplus December 31, 1930	$3,406,927.33

Consolidated Cement Corp. Bond Holders' Protective Committee

THE Consolidated Cement Corp., Chicago, Ill., defaulted on the principal of the 6½% notes due March 1, 1931, and a protective committee has been formed for the benefit of noteholders. It is stated that the company endeavored during recent months to develop a plan which would be fair to both the noteholders and the company, and recently perfected such a plan, but one stockholder, who is also a director of the company, succeeded in obtaining a temporary injunction preventing the company from offering this or any other plan of refunding the notes without the approval of the court. An appeal from this injunction has been entered.

Protective Committee: Robert A. Drum, Leslie N. Duryea, Nathan L. Jones, Fred Mosher, W. B. Prickitt, P. D. Stokes, William H. Wildes. The committee has as secretary P. D. Stokes, Room 200, 141 West Jackson boulevard, Chicago, Ill. Poppenhusen, Johnston, Thompson & Cole, Chicago, counsel. The depository is the Central Trust Co. of Illinois, 208 South La Salle St., Chicago, Ill.

The committee points out that in the period during which the 6½% notes were outstanding the company was successful in improving property and reducing manufacturing expense by about 10%. In addition to retiring $400,000 first mortgage bonds and $100,000 of the 6½% notes and expending $750,000 for plant improvement, the company was able to increase its working capital from April 1, 1926, to December 31, 1930, by 25%. This improvement was accomplished in spite of a decline in tonnage of cement shipped during the past three years, and despite a drop in price per barrel realized, which in 1930 was 18c less than in 1926.

Although the company defaulted on the 6½% notes on March 1, receivership has not as yet been declared inasmuch as litigation is proceeding on the injunction referred to above.

Cement Companies in Northwest May Consolidate

FROM PRESENT INDICATIONS the long anticipated realignment of cement companies operating on the Pacific Coast will begin in Washington rather than in northern California, as had been generally expected. Negotiations have been on for some time to bring together several of the important units in the Pacific northwest field. Developments indicate that they have now reached an advanced stage. The principal companies operating in Washington are the Superior Portland Cement Co., Pacific Coast Cement Co., the Olympic and Northwestern companies.

Excess plant facilities, highly competitive conditions, declining cement prices and obvious operating and marketing economies that could be effected through mergers are factors in the Pacific Coast cement situation that have indicated a number of consolidations might develop in the near future.

Due to the fact that negotiations were believed to be virtually completed toward bringing about a consolidation of several leading companies in the northern and central California field, it was believed that this section would be the first to see the merger movement get under way.

Failure of the principals to agree on certain details held up the consolidation plan, and from present indications it may be some time before negotiations are renewed.

Eventually it is believed important realignments will occur in this section, as well as among the principal operating companies in the southern California area.—*San Francisco* (Calif.) *Chronicle.*

Credit Meeting Includes Building and Materials Group

A CREDIT CONCLAVE of the representatives of the building and building materials industries, including cement, lumber, brick and structural steel lines, numbering about 100 credit executives, will be one of the 22 credit group conferences which will feature the Credit Congress of Industry of the 36th annual convention of the National Association of Credit Men at Boston, Mass., June 22-27, it was announced recently by Elliot Balestier, Jr., credit group director of the association.

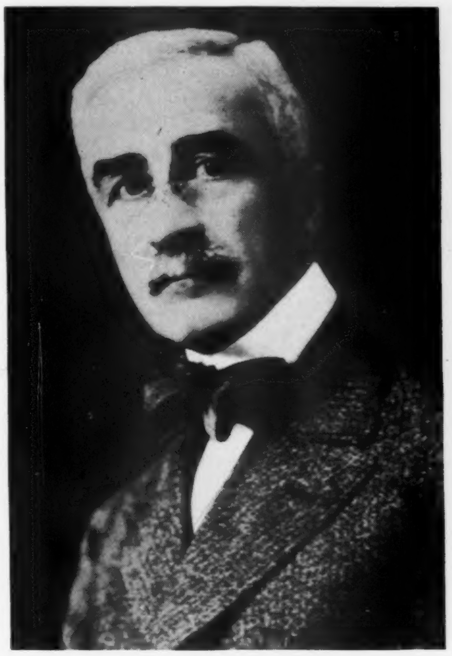
Building and building materials lines, under the chairmanship of E. B. Odenkirk, credit manager of the Medusa Portland Cement Co., Cleveland, Ohio, whose article in Rock Products March 14 discussed this development, along with the other industry groups, will meet June 26 and 27.

The purposes of the credit groups, under the supervision of the National Association of Credit men, are to reduce credit losses, to better credit technique and to improve the organization of credit departments, Mr. Balestier said.

George Bartlett Joins Cement Association Staff

THE APPOINTMENT of George S. Bartlett of Chicago, Ill., as assistant to the chairman of the board of the Portland Cement Association has been announced, to take effect immediately.

Mr. Bartlett has been identified with the good roads movement in a number of states for 20 years. He is generally known as one of the pioneers in securing the introduction of concrete for highway and street paving and as an important figure in the activities of the Portland Cement Association almost since its inception.



George S. Bartlett

Mr. Bartlett has had a long experience and retains a wide acquaintance in the cement and related industries. He was associated with several of the earlier cement companies in an executive capacity and for the past 16 years has been with the Universal Atlas Cement Co. as a special representative. He was retired recently under the 70-year retirement rule of the United States Steel Corp., of which the Universal Atlas company is a subsidiary.

Michigan Cement Plant Ordered Closed

BECAUSE THE price of cement has been forced to a figure below what it costs the state of Michigan to produce the product at its plant at Chelsea, the plant recently was ordered shut down.

Cement manufacturers, through price cutting, now are selling cement for 60 c. a barrel, it was said, while it costs the state $1.44 to manufacture a barrel of it.—*Grand Rapids* (Mich.) *Press.*

Department of Commerce Cement Bulletin Discontinued

SINCE THE ENACTMENT of the 1930 tariff bill the foreign cement trade of the United States has consistently declined. The importance of current import and export statistics and notes on foreign activities has diminished to a point where a bulletin reporting these activities appears to be no longer of significant value. It will therefore be discontinued with reporting these activities for the May 1 issue.

To those requiring regularly monthly statistical returns, two courses are open: (1) To request the Bureau of Foreign and Domestic Commerce to furnish a statement of imports and exports directly each month on the basis of $1 annual payment, or (2) To obtain from the Bureau of Mines its monthly cement statement, which furnishes domestic production, stocks and shipment figures, and import and export figures.

Texas Proposes Cement Tax

AFTER AMENDING its own action so as to reduce the proposed cement tax from 10 to 5 cents per 100 lb., the Texas senate passed the omnibus occupation tax.

The bill now goes back to the house for its concurrence in senate amendments, raising the sulphur production tax, lowering the tax on foot peddlers, and imposing the cement tax.

Senator W. K. Hopkins of Gonzales obtained the cement tax amendment. In arguing for his cement tax, Hopkins told the senate there were nine cement plants in Texas and that six are owned by out-of-state interests.

Challenged by Purl as to why a higher proportionate tax should be placed on sulphur than on cement, Hopkins replied that "the cement trust won't give us any information upon which to base a levy and they pay no tax outside the ad valorem."—*Houston* (Texas) *Chronicle.*

Road Construction in 1931

STATE AND COUNTY expenditures for country roads in 1931 will amount to $1,550,881,000 as compared with $1,552,945,000 in 1930, according to estimates of the American Road Builders Association.

Grouped by sections of the country, New England is spending a total of $86,640,000, the middle Atlantic states $334,975,000, the southern states $404,695,000, the middle western states $538,944,000 and the western states $185,627,000.

Plan New Cement Plant in Ohio

OFFICIALS of the Standard Slag Co., (Bessemer Limestone and Cement Corp. group), Youngstown, Ohio, have leased land near Greenfield for the purpose of building a cement plant.—*Greenfield* (Ohio) *Times.*

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

	Limestone Flux Week ended		Sand, Stone and Gravel Week ended	
District	May 2	May 9	May 2	May 9
Eastern	1,854	1,952	5,563	6,748
Allegheny	2,053	2,072	4,177	4,572
Pocahontas	327	567	1,291	1,276
Southern	685	547	9,003	7,623
Northwestern	833	833	4,821	4,828
Central Western	334	347	7,661	8,955
Southwestern	165	453	5,174	6,018
Total	6,251	6,771	37,690	40,020

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1930 AND 1931

	Limestone Flux		Sand, Stone and Gravel	
	1930	1931	1930	1931
	Period to date		Period to date	
District	May 10	May 9	May 10	May 9
Eastern	45,822	27,582	70,763	40,717
Allegheny	45,399	30,349	71,178	40,710
Pocahontas	5,683	3,898	15,824	12,763
Southern	12,535	11,169	128,665	121,027
Northwestern	13,429	9,449	40,868	31,576
Central Western	9,026	7,250	134,951	83,592
Southwestern	7,377	4,431	98,669	76,310
Total	139,271	94,128	560,918	406,695

COMPARATIVE TOTAL LOADINGS, 1930 AND 1931

	1930	*1931*
Limestone flux	***139,271***	***94,128***
Sand, stone, gravel	***560,918***	***406,695***

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of May 30:

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

22759. **Common building sand and screened or crushed gravel,** carloads (See Note 3), from Scotia, N. Y., to stations on the D. & H. R. R. and C. & C. V. R. R. (Exhibit showing destination stations and present and proposed rates will be furnished upon request.) Reason—To establish commodity rates comparable with those now published between other points in the same territory.

22826. **Stone, broken or crushed,** in bulk, in gondola or other open top cars (See Note 3), from Branford (Pine Orchard Quarry), Conn., to Newport, R. I. Present, $1.45 per net ton; proposed, $1.20. Reason: To meet barge competition.

22844. **Stone, broken or crushed** (will not apply on agricultural limestone, poultry grit, mica crystal grit, fluxing stone, dolomite, limestone, phosphate rock or stone dust), in bulk, in gondola or other open cars (See Note 3), from Branford (Pine Orchard Quarry), Conn., to Westerly, R. I. Present, $1 per net ton; proposed, 90c (to expire December 31, 1931). Reason: To meet barge competition.

22852. **Sand, common** (See Note 2), from Harlem River to White Plains, N. Y. Present, $1 per net ton; proposed, 60c. Reason: Proposed rate is necessary to compete with motor truck from other barge discharging points.

22860. **Common sand and screened or crushed gravel,** minimum weight 50 net tons, from Manchester, N. H., to Canobie Lake, N. H. Present, common sand, 60c per net ton, screened or crushed gravel, 70c per net ton; proposed, 50c. Reason: To meet motor truck competition.

22861. **Common sand and screened or crushed gravel,** minimum weight 50 net tons, from Westboro to Newport, N. H.

	Pres.	Prop.
Common sand	70	60
Screened or crushed gravel	80	70

Reason: To meet motor truck competition.

22862. **Stone, crushed** (See Note 3), from West Quincy, Mass. (Rates in cents per net ton.)

To	Prop.	Pres.
Hanover, Mass.	50	85
So. Hanson, Mass.	50	85
Kingston, Mass.	50	90

Reason: To meet motor truck competition.

22875. **Stone, broken or crushed,** in open cars (See Note 2), from Branford (Pine Orchard Quarry), Conn., to River Point, R. I. Present, $1.25 per net ton; proposed, $1 (to expire December 31, 1931). Reason: To restore rate that expired December 31, 1930.

TRANSCONTINENTAL FREIGHT BUREAU DOCKET

12478. **Crushed onyx,** carloads, E. B.: Request for reduction in present rate of 50c per 100 lb., minimum weight 80,000 lb., on crushed onyx, from Phoenix, Ariz., to Texas, Item 3295, Tariff 3-C (I. C. C. No. 1248, H. G. Toll, Agent), account rate of 34½c per 100 lb., minimum weight 50,000 lb., from Denver group points to Texas common points, Item 2414, S. W. L. Tariff 14-N (I. C. C. No. 2226 of J. E. Johanson, Agent).

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

TRUNK LINE ASSOCIATION DOCKET

26937. **Sand,** other than blast, core, engine, fire, glass, grinding, molding, quartz, silex or silica and gravel, carloads (See Note 2), to Bradford, Penn., from Machias, N. Y., 80c and from Springfield, N. Y., 90c per net ton. (See Note 4.)

M-1776. **Sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand), carloads, and **stone, natural** (other than bituminous asphalt rock), **crushed,** carloads (See Note 2), from Rochester, N. Y., to Produce Siding, N. Y., 85c per net ton. Reason—to meet motor truck competition.

26467. **Stone, natural** (other than bituminous asphalt rock), **crushed, coated with oil, tar or asphaltum,** carloads (See Note 2), from Little Falls, N. Y., to Cortland, N. Y., and Homer, N. Y., $1.50 per net ton.

26785. **Crushed stone,** carloads (See Note 2), from White Haven and Hendlers, Penn., to Honesdale and Prompton, Penn., $1.30 per net ton.

26945. **Limestone, unburned, ground,** carloads, minimum weight 50,000 lb., from West Athens, N. Y., to Stony Ford, N. Y., $2 per net ton. (Present rate, 21½c per 100 lb., sixth class.) Reason—Proposed rate is comparable with rate to West Haverstraw, N. Y., and Weehawken, N. J.

26948. **Sand,** in open top cars, carloads (See note 2), from Tatesville, Penn., to Brownsville, Penn., $1.70 per net ton. Reason—Proposed rate is comparable with rates to Pittsburgh and Uniontown, Penn.

26963. **Crushed stone, coated with oil, tar or asphaltum,** carloads (See Note 2), from Shainline, Penn., to stations on the Reading Co. Rates ranging from 70c to $1.95 per net ton. Reason—Proposed rates are 10c per net ton higher than rates on crushed stone from Shainline, Penn.

26964. **Stone, natural** (other than bituminous asphalt rock), **crushed, coated with oil, tar or asphaltum,** carloads (See Note 2), to stations on the N. Y., O. & W. Ry., Firthcliffe, Middletown, Ellenville, Hurley, Monticello, Liberty, Horton, Chiloway, Trout Brook and various from South Amsterdam, N. Y., rates ranging from $1.70 to $2 per net ton and from South Bethlehem, N. Y., rates ranging from $1.60 to $1.90 per net ton. Reason: Proposed rates are fairly comparable with rates from Jamesville, N. Y., to East Branch, Liberty, Summitville and Cornwell, N. Y.

26965. **Crushed stone and screenings,** carloads (See Note 2), from Honey Creek, Shraders and Naginey, Penn., to Johnstown, Penn., $1.20 per net ton. Present rate—$1.85 per net ton. See Note 4.)

26977. (A) **Crushed stone,** carloads; (B) **crushed stone, coated with oil, tar or asphaltum,** carloads (See Note 2), from Glen Mills, Penn., to Longport, N. J. (A) $1.40, and (B) $1.50 per net ton. (See Note 4.)

26981. **Crushed stone,** carloads (See Note 2), from Rock Hill, Penn., to Philadelphia, Penn., 85c per net ton. Present rate, 90c. (See Note 4.)

26985. **Sand (blast, core, engine, fire, foundry, glass, molding, quartz, silex or silica),** in straight or mixed carloads (See Note 2), from Arroyo, Penn., to Johnsonburg, Penn., $1.26; Titusville, Penn., $1.50; Monongahela, Penn., $1.90, and Scottdale and Johnstown, Penn., $2.29 per net ton. (See Note 4.)

26986. (A) **Building sand,** carloads; (B) **sand, blast, engine, foundry, molding, glass, silica, quartz or silex,** carloads (See Note 2), from Tatesville, Penn., Mapleton District, Penn.

	Prop. rates (A)	(B)		Prop. rates (A)	(B)
To points in Penn.			Hooversville	160	180
Ferndale	160	180	Stoyestown	160	180
Krings	160	180	Friedens	160	180
Walsall	160	180	Quemahoning		
Paint Creek	160	180	Junction	160	180
Border	160	180	Ralphton	160	180
Foustwell	160	180	Stoughton	160	180
Holsopple	160	180	Boswell	160	180
Jerome Jct.	160	180	Acosta	160	180

Proposed rates in cents per 2000 lb.

Reason—Proposed rates are same as those currently in effect from Berkley Springs district.

26987. **Sand** (other than blast, engine, foundry, molding, glass, silica, quartz or silex) and/or **gravel,** carloads (See Note 2), from Wilmington, Del., Bacon Hill, Northeast, Charlestown and Principio, Md., to Price, Md., $1.05 per net ton (See Note 4).

26988. **Crushed stone,** carloads (See Note 2), to L. V. R. R. stations, Lopez, Penn., and Dushore, Penn., to Bernice, Penn., incl., from White Haven, Penn., $1.10, and from Hendler, Penn., $1 per net ton. (See Note 4.)

26990. (A) **Lime, building,** carloads; (B) **lime, agricultural and land,** carloads; (C) **lime, chemical, gas or glass, carloads,** minimum weight 30,000 lb., from Bellefonte, Pleasant Gap and Chemical, Penn., to Alton Mine No. 7 to Alsace, Penn., incl. (A) 15c, (B) 12c and (C) 15c per 100 lb. Reason—Proposed rates compare favorably with rates from Pleasant Gap, Penn., to Strattonville, Youngsville and Mansen, Penn.

26993. **Sand** (other than blast, engine, foundry, glass, molding or silica) **and gravel,** carloads (See Note 2), from Wyoanna, Penn., to L. V. R. R. points, Waverly, N. Y., to Half Acre, N. Y., incl. Rates ranging from $1.10 to $1.90 per net ton. (See Note 4.)

26781. (A) **Sand, building,** carloads; (B) **sand, blast, engine, foundry, molding, glass, silica, quartz or silex,** carloads (See Note 2), from Hancock, Md., and Round Top, Md., to Ithaca and East Ithaca, N. Y. (A) $2.50 and (B) $2.75 per net ton.

27004. **Sand,** carloads (See Note 2), from Menantico, N. J., to Somers Point, N. J., 60c per net ton. Rate to expire June 1, 1932. Reason—To meet motor truck competition.

27006. **Rough rip rap stone,** carloads (See Note 2), from Califon, N. J., to Sea Girt, N. J., $1.27 per net ton. Present rate, $1.60. (See Note 4.)

27010. **Sand and gravel** (other than molding, foundry, engine, etc.), carloads (See Note 2), from Alpha, N. J., to Flemington, N. J., 75c per net ton. (See Note 4.)

27011. Cancel present commodity rates on **sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand), carloads, and **gravel,** carloads (See Note 2), from Suspension Bridge, N. Y., and Niagara Falls, N. Y., to points on the N. Y. C. R. R. as shown in Items 395 to 435, inclusive, and 3000 of N. Y. C. Tariff I. C. C. N. Y. C. No. 15844 and W. S. R. R. I. C. C. W. S. No. 6345. Reason—Investigation develops

no traffic has moved for some time, nor is there prospects for future shipments, therefore rates are obsolete.

27019. **Sand,** other than glass, in open top equipment (See Note 2), **Ridgeway, Penn., to Pittsburgh,** Penn., $1.30 per net ton. (Present rate $1.60.) Reason—Proposed rate is comparable with rates from Daguscahonda and Falls Creek, Penn.

27030. **Agricultural and land lime,** carloads, minimum weight 30,000 lb., from Alba-Marl Lime Co., W. Va., Buckeystown, Md., Capon Road, Cedar Creek, Va., Charles-Town, Engle, W. Va., Frederick, Grove, Keller, Md., Martinsburg, Millville, W. Va., Natural-Lime-Marl Co.'s Siding, W. Va., Oranda, Stephens City, Strasburg, Strasburg Junction and Vaucluse, Va., **to Boring, Md.,** 12½c per 100 lb. (Present rate 13c.) Reason—Proposed rate is comparable with rates from Bellefonte and Pleasant Gap, Penn.

27031. **Stone, crushed or broken, and stone screenings,** carloads (See Note 2), from Waynesboro, Penn., to Western Maryland Railway stations, Druid, Deerfield, Edgemont, Md., Chambersburg, Shippensburg, Penn., Hagerstown, Md., Jerome, W. Va., State Line, Rowan, Penn., Wyatt, W. Va., Gettysburg, Penn., Lime Rock Siding, Elkins Junction, Deer Lick Mine, Bergoo, Webster Springs, W. Va., and various. Rates ranging from 60c to $2 per net ton. Reason—Proposed rates are fairly comparable with rates from Cavetown, Md.

26839. **Sand, blast, engine, glass, quartz, silex or silica,** carloads (See Note 2), from Hancock and Round Top, Md., to Knox, Marienville, Penn., $2.10 and Parkers Landing, Penn., $1.95 per net ton.

26467. **Stone, natural** (other than bituminous asphalt rock), **crushed, coated with oil, tar or asphaltum,** carloads (See Note 2), from Little Falls, N. Y., to Gee Brook, $1.90 per net ton.

27040. **Common sand,** carloads (See Note 2), from Philadelphia, Penn., to North Glenside, Penn., 80c per net ton. (Present rate, 90c) (See Note 4).

27056. **Stone, crushed or broken,** carloads (See Note 2), from Oriskany Falls, N. Y., to Bouckville, N. Y., 30c per net ton, minimum $15 per car. (Present rate, 75c.) Reason: To meet motor truck competition.

26858. (A) **Building lime,** carloads, minimum weight 30,000 lb.; (B) **lime, agricultural, chemical and land,** carloads, minimum weight 30,000 lb., also **unburnt ground or pulverized limestone,** carloads, minimum weight 50,000 lb., from Bellefonte, Pleasant Gap and Chemical, Penn., to Harrisburg, Penn., (A) 9½c, and (B) 9c per 100 lb.

27060. **Molding sand,** carloads (See Note 2), from Grant, Penn., to Beaver Falls, New Castle, Penn., $1.80, Youngstown, Ohio, $1.90, and Cleveland, Ohio, $2.25 per net ton. Reason: Proposed rates are comparable with rates from Hutchins, Penn., and Irvine Mills, N. Y.

27062. **Crushed stone, sand and gravel,** carloads, from LeRoy and Buffalo, N. Y., to Johnsonburg, Penn., $1.30 per net ton. Present rate $1.40. Reason: Proposed rate is comparable with rates to Bellefonte and Pleasant Gap, Penn.

27077. **Crushed stone and screenings,** carloads (See Note 2), from **Ashcom,** Penn., to Manns Choice, Penn., *50c per net ton. To expire November 1, 1931.

*Applicable only when in lots of 10 cars or more at one time.

Reason: Proposed rate is comparable with rate from Naginey, Penn., to Lewistown, Penn.

CENTRAL FREIGHT ASSOCIATION DOCKET

28543. To establish on **agricultural limestone screenings,** carloads, in open-top cars, minimum weight 50 tons, from Whitehouse, O., to points in Michigan (representative points shown in Exhibit A), rates as shown in exhibit attached.

EXHIBIT A

From Whitehouse, O., to Representative Points in Michigan (rates in cents per net ton)

To	Pres.	Prop.	To	Pres.	Prop.
Byron	115	112	Pennocks	155	142
Durand	115	112	Marion	165	142
Carland	125	122	Park Lake	165	142
Elsie	125	122	McBain	165	142
Bannister	125	122	Lucas	165	142
Ashley	125	122	Cadillac	165	147
North Star	135	127	Millersville	175	147
Ithaca	135	127	Boon	175	147
Alma	135	127	Harrietta	175	147
Forest Hill	135	127	Yuma	175	147
Shepherd	135	132	Mesick	175	152
Mt. Pleasant	145	132	Harlan	185	152
Rosebush	145	132	Pomona	185	152
Clare	145	137	Copemish	185	152
Farwell	155	137	Thompsonville	185	152
Lake George	155	137	Homestead	185	152
Clarence	155	142	Case's Siding	185	152
Temple	155	142			

28548. To establish on **crushed stone,** carloads, from Greenfield, O., to Derby, O., rate of 80c per net ton. Route—Via D. T. & I. R. R., Washington C. H., O., and B. & O.-W. Present rate, 90c.

28546. To establish on **molding sand,** carloads (See Note 3), from Grant, Penn.

To	Prop.	Pres.
Beaver Falls, Penn.	*$1.80	14c
New Castle, Penn.	* 1.80	15½c
Youngstown, O.	* 1.90	15½c
Cleveland, O.	* 2.25	16½c

*Per net ton.

28549. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel,** in carloads, from Jonesville, Mich., to Walbridge, O., rate of 88c per net ton. Present rate, 127c.

28552. To establish on **sand,** viz., **lake, river and bank,** other than sand loam, carloads, from Gary, Calumet and Willow Creek, Ind., to Cleveland, O., rate of 215c per net ton. Present rate, 252c. Routes—Wabash Ry., Toledo, O., N. Y. C. R. R.; Wabash Ry., Toledo O., W. & L. E. Ry.; Wabash Ry., New Haven, Ind., N. Y. C. & St. L. R. R.

28556. To establish on **lime, agricultural hydrated,** having no commercial value for chemical or building purposes, in sacks, carloads, minimum weight 30,000 lb., from Milltown, Ind., to Huntingburg, Ind., rate of 7c (applicable on traffic destined to stations on the Ferdinand Railroads). Present rate, 8c.

28557. To establish on **crushed stone,** carloads (See Note 3), from White Sulphur, O., to Crestline, Vernon, Shelby, Shiloh and Greenwich, O., rate of 60c per net ton. Present rate, 70c.

28564. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel,** carloads, from Worth, Ill. (Rates in cents per net ton.)

	Prop.	Route		Prop.	Route
To points in Indiana:			Huntington	115	B
Willow Creek	80	A	Logansport	110	B
Crocker	80	A	South Bend	90	C
Westville	85	A	To points in Michigan:		
Magie	85	A	Adrian	207	A
Kingsbury	90	A	Britton	207	A
N. Liberty	90	A	Milan	207	A
Pine	90	A	Romulus	230	A
Pakeville	105	A	Detroit	230	A
Wyatt	110	A	To points in Ohio:		
New Paris	110	A	Montpelier	140	A
Millersburg	115	A	Alvordton	161	A
Wilcottville	120	A	Maumee	230	A
Stroh	125	A	Wauseon	207	A
Ashley Hudson	125	A	West Unity	161	A
Hamilton	138	A	Toledo	230	A
Butler	138	B	Napoleon	207	A
St. Joe	138	B	Defiance	207	A
New Haven	138	B	Cecil	161	B
Ft. Wayne	125	B			

A—Wabash Ry. direct (will not apply via Bement, Ill.)

B—Wabash Ry., New Paris, Ind., Winona R. R., Peru, Ind., Wabash Ry.

C—Wabash Ry., Pine, Ind., N. J. I. & I. R. R.

Present: Classification basis.

28572. To establish on **sand, lake, river and bank,** carloads, from Miller (Lake Co.), Ind. Rates in cents per net ton.)

	Pres.	Prop.		Pres.	Prop.
To Wisconsin points:			To Illinois points:		
Kenosha	139	103	Lake Forest	139	93
Milwaukee	139	123	N. Chicago	138	103
Racine	139	123	Rondout	139	103
			Waukegan	138	103
			W. Chicago	123	93

28590. To establish on **crushed stone,** carloads, from Whitehouse, O., to stations on N. Y. C. R. R. (via Toledo, O.), viz. (rates in cents per net ton):

	Rate		Rate
To points in Ohio:		Gypsum	85
Moline	70	Danbury	90
Luckey	75	Venice	90
Pemberville	75	Sandusky	90
Woodside	80	Huron	95
Wayne	80	Ceylon	100
Hatton	85	Vermillion	100
Fostoria	85	Brownhelm	100
New Riegal	90	Amherst	105
Berwich	90	Elyria	105
McCutchenville	95	Holland	70
Sycamore	95	Swanton	80
Duenquat	95	Delta	80
Lamert	100	Wauseon	85
Spore	100	Pettisville	85
Bucyrus	100	Archbold	90
Millbury	70	Stryker	90
Genoa	70	Bryan	95
Elmore	75	Melhern	100
Lindsey	80	Edgerton	100
Fremont	85	Lime City	70
Clyde	90	Dowling	75
Bellevue	90	Dunbridge	75
Monroeville	95	Sugar Ridge	75
Norwalk	95	Bowling Green	80
Collins	100	Portage	80
Wakeman	100	Mermill	80
Kipton	105	Cygnet	85
Oberlin	105	Galatia	85
Elyria	105	Van Buren	85
Martin	70	Mortimer	90
Graytown	75	Findlay	90
Rocky Ridge	80	Beagle	95
Oak Harbor	80	Arlington	95
La Carne	85	Williamstown	100
Port Clinton	85	Dunkirk	100

Present—Classification rating.

28607. To establish on **molding sand,** carloads, from Eau Claire, Mich.:

To	Prop.	Pres.
South Bend, Ind.	101	220
La Porte, Ind.	113	176

(Rates in cents per net ton.)

28610. To establish on **crushed stone,** carloads, from White Sulphur, O., to Sidney, O., rate of 80c per net ton. Present—14½c.

28612. To establish on **crushed stone and crushed stone screenings,** etc., carloads, from Delphos, O., to Keifersville, O., rate of 65c per net ton. Route—Via N. Y. C. & St. L. R. R. direct. Present—70c.

28614. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishings, loam, molding or silica) **and gravel,** in carloads, from Jamestown, Penn., to Wick, O., rate of 70c per net ton. Present—90c.

28626. To establish on **sand and gravel,** carloads, from Urbana, O., **to Springfield, O.,** rate of 45c per net ton, rate to apply only for C. C. C. & St. L. Ry. delivery and to expire November 30, 1931. Present—50c.

26628. To establish on **sand and gravel,** carloads, from Cleves, O., to Batesville, Ind., rate of 60c per net ton. Present—70c.

28629. To establish on **sand and gravel,** carloads, from Urbana, O., to Jewells, O., rate of 40c per net ton, proposed rate to expire November 1, 1931. Present—60c.

28633. To establish on **crushed stone, coated with oil, tar or asphaltum,** carloads, actual weight will apply, to points in Trunk Line Association territory.

From Marion, O.: Proposed rates—Rates based on a rate of $3.80 per net ton, Marion, O., to New York, N. Y.

From Marble Cliff, O.: Proposed rates—Same specific rates to all Trunk Line basing points as from Marion, O. Present rates—Classification basis.

28644. To establish on **crushed stone, coated with oil, tar or asphaltum,** carloads, from Jamestown, N. Y., to points in Ohio, Penn. and N. Y. (representative points shown in Exhibit A).

EXHIBIT A

B. & L. E. R. R. To (representative points)	Pres. rate	Prop. rate
Conneaut, Ohio	142	142
Adamsville, Penn.	153	142
Greenville, Penn.	176	142
Shenango, Penn.	......	142
N. Y. C. R. R.		
Ashtabula, Ohio	153	153
North Girard, Penn.	......	142
Erie, Penn.	130	130
Frewsburg, N. Y.	......	96
North Warren, Penn.	......	96
Irvineton, Penn.	153	107
Sharon, Penn.	188	153
N. Y. C. & St. L. R. R.		
North East, Penn.	119	119
Wesleyville, Penn.	119	119
Conneaut, Ohio	142	142
Ashtabula, Ohio	153	153
Penn. R. R.		
Warren, Penn.	142	107
Youngsville, Penn.	153	107
Jamison, Penn.	......	142
Rouseville, Penn.	......	142
Titusville, Penn.	176	130
Tryonville, Penn.	......	119
Summerdale, N. Y.	......	107
Foxburg, Penn.	......	153
Pittsburgh, Penn.	......	199
B. & O. R. R.		
Girard, O.	......	176
Pittsburgh, Penn.	......	199
P. & L. E. R. R.		
Pittsburgh, Penn.	......	199

28647. To establish on **crushed stone** (in bulk), and **limestone, unburned agricultural** (in bulk in open top cars), in carloads, from Spore, Ohio, to Swiss, W. Va., rate of 185c per net ton. Present. 215c.

28677. To establish on **crushed stone,** coated with tar, etc., carloads, from Keeport, Ind., to points in Indiana, Ohio and Michigan, representative rates as shown in Exhibit B attached. Present, class rates.

EXHIBIT B
KEEPORT, INDIANA

Exhibit B, from Keeport, Ind., to representative points, routing, and proposed rates per net ton.

Decatur, Ind.; Wab.-Huntington, Ind.-Erie, Wab.-Ft. Wayne, Ind.-Penn., $1.42.

Van Wert, Ohio; Wab.-Ft. Wayne, Ind.-Penn., **Wab.-Cecil,** O.-Cin. No.; $1.53.

Hartford City, Ind.; Wab.-Logansport, Ind.-**Penn.; $1.19.**

Portland, Ind.; Wab.-Ft. Wayne, Ind.-Penn.; $1.42.

Celina, Ohio; Wab.-Cecil, O.-Cin. No.; $1.53.

Grand Ledge, Mich.; Wab.-Romulus, Mich.-P. M.; $2.11.

Sturgis, Mich.; Wab.-Ft. Wayne, Ind.-Penn.; $1.53.

Grand Rapids, Mich.; Wab.-Ft. Wayne, Ind.-Penn.; $1.99.

Kalamazoo, Mich.; Wab.-Ft. Wayne, Ind.-Penn.; $1.76.

Muskegon, Mich.; Wab.-Ft. Wayne, Ind.-Penn.; $2.11.

Big Rapids, Mich.; Wab.-Ft. Wayne, Ind.-Penn.; $2.34.

White Pigeon, Mich.; Wab.-Ft. Wayne, Ind.-N. Y. C.; $1.76.

Sturgis, Mich.; Wab.-Ft. Wayne, Ind.-N. Y. C.; $1.76.

Coldwater, Mich.; Wab.-Ft. Wayne, Ind.-N. Y. C.; $1.76.

Jackson, Mich.; Wab.-Ft. Wayne, Ind.-N. Y. C.; $1.88.

Jackson, Mich.; Wab.-Alvordton, O.-C. W.; $1.88.

Mt. Clemens, Mich.; Wab.-Detroit, Mich.-G. T.; $2.22.

Jackson, Mich.; Wab.-Milan, Mich.-AA-Lakeland, Mich., G. T., Wab.-Detroit, Mich.-G. T.; $2.22.

Watervliet, Mich.; Wab.-Lafayette, Ind.-C. I. & L.-Mich. City, Ind.-P. M.; $1.76.

Zeeland, Mich.; Wab.-Lafayette, Ind.-C. I. & L.-Michigan City, Ind.-P. M.; $2.11.

Grand Rapids, Mich.; Wab.-Lafayette, Ind.-C. I. & L.-Michigan City, Ind.-P. M.; $2.11.

Grand Haven, Mich.; Wab.-Lafayette, Ind.-C. I. & L.-Michigan City, Ind.-P. M.; $2.11.

Muskegon, Mich.; Wab.-Lafayette, Ind.-C. I. & L.-Michigan City, Ind.-P. M.; $2.11.

White Cloud, Mich.; Wab.-Lafayette, Ind.-C. I. & L.-Michigan City, Ind.-P. M.; $2.68.

Big Rapids, Mich.; Wab. Lafayette, Ind.-C. I. & L.-Michigan City, Ind.-P. M.; $2.68.

Dowagiac, Mich.; Wab.-Logansport, Penn.-So. Bend-M. C.; $1.42.

Kalamazoo, Mich.; Wab.-Logansport, Penn.-So. Bend-M. C.; $1.76.

Marshall, Mich.; Wab.-Logansport, Penn.-So. Bend-M. C.; $1.88.

28683. To establish on **crushed stone**, carloads, from North Baltimore, Ohio, to Wooster, Ohio, rate of 80c per net ton. Present rate, 90c. Route—Via B. & O. R. R. direct.

28684. To establish on **stone, crushed** (in bulk), **crushed stone screenings** (in bulk), **agricultural limestone** (not ground or pulverized, in bulk, in open top cars only), and **agricultural limestone screenings**, in carloads, from Sandusky, Ohio.

To Points in Ohio

N. Y. C. R. R. Stations

	Prop.	Pres.		Prop.	Pres.
Simons	125	140	Youngstown	125	140
Kinsman	125	140	Amsterdam	125	140
Latimer	135	140	Dillonvale	135	140
Tyrell	125	140			

Erie R. R. Stations

	Prop.	Pres.		Prop.	Pres.
Leetonia	125	140	Cortland	115	220
Colemans	125	140	Binghill	125	220
Lisbon	135	140			

28711. To establish on (a) **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica), and **gravel, carloads**, from Kenneth and Lake Ciecott, Ind., and (b) agricultural limestone, unburned, crushed stone and stone screenings, in bulk, in open top cars, carloads, from Kenneth, Ind., to Royal Center, rate of 50c per net ton, said rate to expire December 31, 1931. Route—P. R. R. direct. Present, 60c.

28745. To establish on (a) **crushed stone** and **crushed stone screenings**, etc., carloads, from Bluffton, Ind., to Roseburg, Herbst, Marion, Swayzee, Sims, Sycamore and Greentown, Ind., rate of 60c per net ton. Present, 60c to Marion (no change); 76c to Roseburg, Herbst and Swayzee, and 88c per net ton to Sims, Sycamore and Greentown, Ind. (b) **Sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), **and gravel**, in open top cars only, carloads, from Dundee, Noblesville and Peru, Ind., to points shown below, rate of 60c per net ton. (Rates in cents per net ton.)

To points in Indiana

	Present (1)	(2)	(3)		Present (1)	(2)	(3)
Marion	99	*104	†	Greentown	80	88	†
Roseburg	99	*104	†	Vermont	80	88	†
Herbst	99	*104	†	Kokomo	65	70	x60
Swayzee	99	88	†	Fairfield	65	70	....
Sims	99	88	†	Sharpsville	65	70	....
Sycamore	99	88	†	Jacksons	65	70	....

(1) From Dundee, Ind. (2) From Noblesville, Ind. (3) From Peru, Ind.

x No change. *No specific rate-intermediate to Bluffton, Ind. †Sixth class.

28757. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), **and gravel**, carloads, from Hugo, Ohio, to Rocky River, Ohio, rate of 70c per net ton. Present, 80c.

28761. To establish on **grinding sand**, carloads, from Manistee, Mich., to Rossford, Ohio, rate of 101c per net ton to apply only via P. M. Ry. and the Toledo Terminal R. R. Present, 126c.

28762. To establish on **crushed stone**, carloads, to Detroit, Mich., rate of 135c from Keeport and 125c per net ton from Huntington, Ind. Route: Wabash direct; Wabash and D. T. & I. Present, 161c from Keeport, Ind., and 164c per net ton from Huntington.

28763. To establish on **agricultural lime**, carloads, minimum weight 30,000 lb., from Scioto, Ohio, to Belle Vernon, Penn., rate of 11½c. Present, 21c.

28764. To establish on **limestone, raw dolomite**, in box cars, carloads (See Note 3), from Woodville, Ohio, in cents per net ton:

To.	Pres.	Prop.
Anderson, Ind.	390	170
Clarksburg, W. Va.	460	210
Dunkirk, Ind.	340	165
Elmwood, Ind.	*202	180
Gas City, Ind.	390	170
Grafton, W. Va.	460	210
Hartford City, Ind.	360	170
Kokomo, Ind.	400	180
Marion, Ind.	390	170
Muncie, Ind.	*202	170
Olean, N. Y.	500	215
Shirley, Ind.	400	180
Upland, Ind.	390	170

*Gross ton.

ILLINOIS FREIGHT ASSOCIATION DOCKET

6190. **Gravel, gravel pit strippings, and sand pit strippings**, carloads, from Kinderhook, Ill., to Barry, Maysville, Griggsville, Pittsfield, Naples, Bluffs, etc., Ill. Rates per net ton. Pres., 63; prop., 50.

6194. Cancel all commodity rates on **crushed stone**, carloads, from Marshall, Ill., to points of destination in I. R. C. territory account obsolete.

6201. **Sand and gravel**, carloads (See Note 2), but not less than 40,000 lb., from Metropolis, Ill., to Salem, Cartter and Kell, Ill. Rates per net ton. Pres., $1.26; prop., $1.05.

WESTERN TRUNK LINE DOCKET

4264-F. **Sand and gravel**, carloads (See Note 3), but in no case shall the minimum carload weight be less than 40,000 lb. From Luverne, Minn., to Sioux Falls, S. D. Rates: Present—5c per 100 lb. Proposed—64c per ton of 2000 lb.

SOUTHERN FREIGHT ASSOCIATION DOCKET

55167. **Sand**, carloads, Evansville, Ind., Henderson and Owensboro, Ky., to South Pittsburg, Tenn., and Bridgeport, Ala., and N. C. & St. L. Ry. stations, Glencliff, Tenn., to Murfreesboro, Tenn., inclusive. It is proposed to cancel present specific commodity rates on molding sand, carloads, from Evansville, Ind., Owensboro and Henderson, Ky., to Bridgeport, Ala., and South Pittsburg, Tenn., as provided in Agent Speiden's Freight Tariff 195-A, I. C. C. No. 1408, of $2.25 per ton of 2000 lb. and to apply in lieu thereof the rate of $1.70 per ton provided in Agent Glenn's Freight Tariff No. 88-A, I. C. C. No. A-655, and to revise rate from same origins to N. C. & St. L. Ry. stations, Glencliff to Murfreesboro, Tenn., inclusive, to be $1.58 per net ton.

55246. Revision of rates on **limestone, ground or pulverized**, carloads, intraterritorially, between points in Southern territory. It is proposed to revise rates on limestone, ground or pulverized, carloads, between points in Southern territory, on basis of mileage scale substantially the same as prescribed by the I. C. C. in Docket No. 22771. Copy of the proposed scale will be furnished upon request.

SOUTHWESTERN FREIGHT BUREAU DOCKET

22943. **Broken stone**, from Silverdale, Kan., to Chilocco, Okla. To establish a rate of 85c per ton of 2000 lb. on broken stone, carloads (See Note 3), from Silverdale, Kan., to Chilocco, Okla. It is stated that there is to be an appreciable movement of broken stone from Silverdale, Kan., to Chilocco, Okla., and in order for rail carriers to handle it, the proposed rate is necessary. Proposed rate approximates transportation charges that have been quoted by motor truck company. It is stated that the proposed basis is reasonable for a distance of 15 mi. when compared with the rate of 70c under I. C. C. 9702 scale and 71c under I. C. C. Docket 17000, part 11 scale.

22952. **Crushed stone**, from Georgia points to points in Louisiana and Texas. To cancel the present through rates applying on crushed stone, as described below, from Conyers, Lithonia, Redan and Stone Mountain, Ga., to points of destination in Louisiana and Texas, as shown in S. W. L. Tariffs No. 1-Q and 95-G, allowing combination to apply:

Description on factors east of Mississippi River: Crushed stone (except bituminous rock or bituminous asphalt rock), carloads (See Note 3).

Description on factors west of Mississippi River: Crushed stone (broken stone ranging in size up to 200 lb. weight), **including ground limestone** in bulk or in bags, **but not including gypsum** rock, carloads (See Note 3).

At the present time a through rate of $7.90 per ton is published in Item 9845, S. W. L. Tariff 1-Q on crushed stone, carloads, from Conyers, Lithonia, Redan and Stone Mountain to Texas common points and a rate of $10.22 per net ton is published in Item 5650, S. W. L. Tariff 95-G to El Paso, Tex., and points taking same rates. It is stated that in practically every instance these rates, or rates made with relation thereto, can be reduced on basis of Memphis, Vicksburg or New Orleans combination, using as factors the rates published in Agent Speiden's Sand and Gravel Tariff I. C. C. A-655 to the Mississippi River crossings and the rates published in S. W. L. Tariff 162C beyond. These tariffs are both subject to Rule 56 of Tariff Circular 20 (reduction of rates to equal the aggregate of intermediate rates) and it is stated in almost every instance where shipments move the carriers are compelled to reduce the rates to the combination basis and file application with the I. C. C. for authority to make refund to the basis of intermediate rates. It is, therefore, suggested that the present through rates be canceled, allowing combination to apply.

22990. **Sand, crushed stone, etc.**, from Cape Girardeau, Mo., to points in Missouri. To establish the following rates in cents per ton of 2000 lb. on sand (except asbestos sand and silica sand); stone, crushed; limestone, broken or crushed (other than agricultural limestone); rock, broken or crushed, and gravel, carloads (See Note 3), from and to points shown below.

From Cape Girardeau, Mo., to Points in Missouri

	Rates		Rates
Delta	56	Bertrand	68
Caney Creek	56	Buckeye	68
Oran	56	Sargent	68
Morley	62	Miner	68
Blodgett	68	Sikeston	68
Diehlstadt	68	Browns	68
Charleston	68	Little River	68
Melon Switch No. 3	68	Morehouse	68

The proposed rates are currently applicable via the St. L.-S. F. direct, and it is desired to meet the rate via Mo. Pac. direct, through Charleston, Mo.; via other routes upon request.

22994. **Silica sand**, from New Orleans, La., to El Paso, Tex. To establish a rate of 29c per 100 lb. on silica sand, carloads (See Note 2), from New Orleans, La., to El Paso, Tex. Prior to October 17, 1929, S. W. L. Tariff 95-G named rate of 29c on silica sand from New Orleans to El Paso, but on that date this item was canceled and reference made to S. W. L. Tariff 162, containing rates prescribed by the Interstate Commerce Commission in Docket 17000, part 11. The rates named in the last mentioned publication are specifically restricted to not apply on silica sand, and it would seem that the 29c rate should not have been canceled in so far as this commodity is concerned. The suggested rate, while being the same as that previously in effect, is representative of Column 9½% of the Column 100 scale in Docket 13535, which basis the defense carriers in I. C. C. Docket 17000, part 11-A, are endeavoring to justify. In view of this, it is felt there can be no valid objections to the rate contemplated.

I. C. C. Decisions

3518. Phosphate Rock. Proportional commodity rates on phosphate rock, from Gulf ports to Memphis, Tenn., St. Louis, Mo., and East St. Louis, Ill., suspended in I. and S. No. 3518, phosphate and related commodities (coastwise traffic) from the Gulf ports to Memphis, St. Louis and East St. Louis, have been found not justified by the commission, division 4, without prejudice, however, to the publication of higher rates. The St. Louis-San Francisco and the Alabama, Tennessee and Northern, in particular, were interested in having the rates established. They desired to haul phosphate rock produced in Florida and brought to the Gulf ports by vessel to Memphis and the St. Louis district.

Upon protest of the Louisville and Nashville and producers of such rock in Tennessee the schedules were suspended. The contention was that the rates were too low and were lower than necessary to enable the Florida rock to get into the markets mentioned.

The respondents objected to assuming the burden of proof on the ground that such burden attached only when increased rates were under consideration.

Objection was also made to the introduction of testimony on the point whether the rates as proposed were needed to enable the Florida rock to get into the markets mentioned.

The commission said its inquiry should go no further than to ascertain whether the carrier or carriers in question had good reason to believe that the rate established or proposed was necessary to enable the traffic to move.

The report contains a detailed study of ton-mile and car-mile earnings, the commission saying that the ton-mile earnings, ranging from 3.553 mills from New Orleans to St. Louis to 4.603 mills were low, but that due to the heavy loading of the cars the car-mile earnings were not unusually low. The commission concluded that the new traffic would produce a substantial profit over out-of-pocket or added cost.

The commission found that the suspended schedules have not been justified, and they will be ordered canceled. This finding, however, is without prejudice to the establishment of rates of $2.45 and $3.77 per gross ton to Memphis and St. Louis or East St. Louis, respectively, except over routes participated in by the Mobile and Ohio and except over the routes numbered 49, 50, 55, 85, 100, 105, 115 and 120 in the suspended schedules. The tariffs naming such rates should provide that the minimum weight shall be the maximum capacity of the car used, except that actual weight shall apply where cars are loaded to their full visible carrying capacity.

22020. Cement. Iola Cement Mills Traffic Association et al. vs. Atchison, Topeka and Santa Fe Railway Co. et al. Rates on cement from Portland and Boettcher, Colo., and Laramie, Wyo., to destinations in Colorado and Wyoming found unduly preferential of shippers at those points and unduly prejudicial to shippers from Dewey, Okla., and the Kansas gas belt to the same destinations to the extent that such rates are less than the average of Scales III and IV prescribed in *Western Cement Rates*, 48, I. C. C. 201.

It was found rates from Portland and Boettcher, Colo., and Laramie, Wyo., to destinations in Colorado on and east of the so-called Colorado common-point line and to destinations in southeast Wyoming on the U. P. R. R. east of and including Laramie and on the C. B. & Q. R. R. east of and including Cheyenne are, and for the future will be, unduly preferential of shippers at those points to the extent that the rates from Portland, Boettcher, and Laramie are less than rates based on the average of cement Scales III IV prescribed in *Western Cement Rates, Supra*, subject to a carload minimum of 50,000 lb., which rates, it was found, will be just and reasonable for the transportation of the intrastate freight here involved in the states of Colorado and Wyoming, respectively; provided, however, that the rate from Laramie to Denver, Colo., may be made the same as the rate from Portland to the same destination.

21765. **Demurrage charges on cement.** Interstate Engineering and Construction Co. vs. Pennsylvania Railroad Co. Ruling was that Commission has no jurisdiction over demurrage charges assessed for the detention of cars moving in intrastate commerce. Complaint dismissed.

23019. Silica Sand. Terre Haute Chamber of Commerce et al. vs. Baltimore and Ohio Railroad Co. et al. Rate on crude silica sand, in carloads, from Pacific, Mo., to Terre Haute, Ind., found unreasonable, but not unduly prejudicial. Reasonable rate prescribed for the future and reparation awarded.

It was found that the rate on crude silica sand, in carloads, from Pacific, Mo., to Terre Haute, Ind., was in excess of the aggregate of intermediate rates and unreasonable during the period covered by the claim for reparation, to the extent that it exceeded $2.48. It was also found that the rate assailed is, and for the future will be, unreasonable to the extent that it exceeds or may exceed $1.90.

23875. Roofing Slag. Norwalk Roofing Co. vs. New York, New Haven and Hartford et al. By division 5. Rates, roofing slag, Reading, Penn., to Greenwich and South Norwalk, Conn., unreasonable, past, present and future, to extent they exceeded and exceed $2.45 a net ton to Greenwich and $2.55 to South Norwalk. Reparation of $197.66 awarded. Order for future effective on or before July 29.

Cement Rate Cut Approved by I. C. C.

INTERSTATE Commerce Commission has authorized railroads to establish reduced rates on cement from producing points in Maryland, eastern Pennsylvania, western New Jersey, Virginia and West Virginia to destinations in trunk line territory and certain points in central territory, without observing the long and short haul provisions of the Interstate Commerce Act.

Effect of ruling is to allow certain carriers to reduce rates to farther-distant points without applying similar cuts to intermediate destinations.

Conditions are attached to ruling which prescribe certain limitations regarding application of these rates to shipments over certain routes in line with usual technical safeguards imposed in special relief cases of this sort.

New rates are based on distances computed over the shortest possible routes embracing not more than a specified number of lines from and to common, junction and basing points, generally not more than 25 miles apart, and the rates thus determined are extended to contiguous points.

Commission sanction of change is necessary, since otherwise the establishment of rates in manner proposed would result in violations of the fourth section of the Interstate Commerce Act.

New rates benefit consignees in trunk line and central territories and likewise maintain a favorable rate set-up throughout eastern territory for the eastern cement mills.—*The Wall Street* (N. Y.) *Journal.*

Supreme Court to Review Louisiana Sand and Gravel Rates

THE SUPREME COURT recently announced it would review an appeal by the Louisiana Public Service Commission challenging the validity of rates prescribed by the Interstate Commerce Commission for the transportation of sand, gravel, crushed stone and shells, carloads, within the state.

In June, 1929, the Interstate Commerce Commission issued orders fixing rates on shipments of sand, gravel, crushed stone and shells, in carload lots, between certain points within Louisiana, and later supplemented the orders.

The rate applied between points in western Louisiana south of the Illinois Central, the old Vicksburg, Shreveport and Pacific railways, including points on the east bank of the Mississippi river. The state authorities claimed they had power to regulate intrastate lines.

A federal three-judge court at Baton Rouge sustained the Interstate Commerce Commission, holding that it had authority over its jurisdiction over interstate commerce to regulate the intrastate rates on the shipments in question; finding that the orders were aimed to prevent undue discrimination against interstate commerce and relieve it of unreasonable burdens imposed by the rates of the state commission.—*Alexandria* (La.) *Town Talk.*

Promise Nebraska Gravel Rate Reduction

PROMISE OF A reduction in gravel freight rates from 90 points in the state, which will mean a saving of more than $100,000 this year to the state of Nebraska for gravel used in highway work alone, was made recently by the Nebraska state railway commission.

The state will be the chief beneficiary of the rate reduction, Commissioner Drake believes, because of its heavy purchases of gravel for highway maintenance and construction. All state contracts for road building were drawn this year, he said, with a clause providing for a reduction in the contract figure in case of a reduction in freight rates on gravel so that the state rather than private contractors will benefit.

When the rate reduction plan is completed and the order issued, the price on gravel in Nebraska will be materially reduced, J. F. Miller, commission secretary, believes. The application, he said, was made by the Burlington railroad, covering 90 gravel shipping points. He anticipates other railroads will ask similar reductions.—*Lincoln* (Neb.) *Star.*

Propose Gravel Rate Increase in Tennessee

OPPOSING increases in freight rates on gravel shipments, Mayor Watkins Overton, of Memphis, Tenn., and County Commissioner E. W. Hale visited Nashville recently and appeared before the Tennessee Railroad and Public Utilities Commission. Mr. Overton said that the increase in rates would work an unusual hardship on Memphis because of scarcity of gravel in this immediate section. Higher rates would cause the city and county to spend hundreds of thousands of dollars additional each year for building materials in road construction.

Human Nature and the Safety Director*

By J. B. Zook
Safety Director of the Great Lakes Portland Cement Corp., Buffalo, N. Y.

THE underlying result which the safety director should be striving for is such a modification in the desires and purposes both of the plant personnel and of himself that, over a period of time, what he wants and what they want come to be much the same.

What he wants is minds and energies permanently committed to furnishing an agreed aim in a co-operative way. He wants to develop a motivation or urge to action in his group which of itself spontaneously generates from within their efforts to get the results sought. He wants a situation in which co-operation has become the natural and dominant mood and method of his group.

But if all the purposes which control him in his contacts with his group of workers are intrinsically narrow, limited and in essence selfish, they can never attract for long the support of those upon whom success depends. If they include aims which reckon with the natural and developing desires, aspirations and interest of his group, that group loyalty can sooner or later be won. In other words, he may try to use others for purposes to which they are not consciously a willing party—and may seem to succeed temporarily. But far from succeeding in a long-time way and carrying on over a period of years, his exploitation of those whose confidence he has sought will bring its own defeat. The true means of permanently influencing others lies in the direction of fostering conditions in which people in and through their own inner desires come to seek the results which the leader also comes to desire.

Every safety director desires a good morale in his organization. That is, he wants a positive zeal for action in behalf of a known and worthy purpose. Many safety organizers have believed that they could improve morale by various devices such as picnics, athletic events, evening recreational provisions, prize contests for suggestions and endless other expedients. It is easy to recite a variety of methods which temporarily may benefit morale. But a permanent underlying enthusiasm which does not have to be constantly fed with new excitement and inducements is sought in vain in these directions unless something basic is also done to be sure that the members of the organization (1) know what its purposes are; (2) find these purposes congenial to themselves, and therefore (3) find themselves willing and eager to espouse those purposes as their own and seek to realize them as a natural fulfillment of their own personal sense of self-realization and self-satisfaction.

J. B. Zook

The activities which people do well, faithfully and persistently and which give them that vital sense of spontaneous generation from within are those prompted by a realization that they themselves are getting a sense of self-fulfillment from them.

People are quick to detect insincerity, "hokum" or subterfuge. It is supremely necessary that while on the job and face to face with individuals and groups you should "be yourselves," be natural, spontaneous and sincere.

If the results of a certain way of handling a problem, after a thorough trial, are unsatisfactory, the time for critical reflection and for formulating a better plan is afterward. Planning the safety campaign, preparing the educational material, summarizing the results and subsequent evaluation of them—these are for one's private hours. In action, a straightforward and frank attitude is necessary. At the moment of contact with your group you must be a sympathetic and understanding human being and not just a cog in a scheme of production.

In dealing with human nature as found in your own group, you will find and recognize certain characteristics such as self-assertiveness, submissiveness, creativeness, curiosity, sex, pugnacity, the play desire and gregariousness.

Self-assertiveness. This is perhaps one of the strongest of underlying characteristics. The yearning for a sense of individual value, for the chance to make himself look good, to demonstrate to himself and to those whose regard he seeks that he is somebody, this trait is almost universal. This self-regarding sentiment leads one to seek to dominate others, to demonstrate one's superiority over them in some particular direction in order to avoid becoming too completely dominated, to seek applause—in other words, to manifest personal power in any way possible. Now if the working environment can be made to provide an outlet for this self-expression, unquestionably much of the unresponsiveness of manual workers which is laid to laziness, cussedness and indifference can be eliminated. Out of the self-assertive tendency seems to come such good characteristics as the desire to excel in all kind of rivalty, to attain a certain goal, to protect self-pride. And out of a thwarting of this tendency may arise sulkiness, stubbornness, jealousy and defiance. Those who show these distressing tendencies are merely giving notice that their self-regard has been hurt in some serious way. These are signals which the safety director should recognize and take immediate steps to correct, thus turning a really valuable charactertistic to useful work in accident prevention. This outlet may be just the proper one for that person to glorify himself to his heart's content.

Submissiveness. Submissiveness is the exact opposite of self-assertiveness. It is the tendency to subordinate one's self to others, to allow others to lead him through the paths of life. There may be several reasons for this, such as a sincere devotion to another whom he wishes to pattern his actions upon; a sense of temporary expediency; a sense of relief from any responsibility of his own, or a real fear of doing anything else. The value of this tendency may be recognized by the safety leader. The activities of such a person should be carefully guided and the proper influences must be provided for his help. If he is to follow anyone, arrange to have him follow a safe worker, but bear in mind that the health of this arrangement depends largely upon the integrity and intelligence of the purposes held by the leader. At best, this type of workman is vacillating and uncertain.

Creativeness. The desire to do things, to build and construct, is fundamental. In

*Read at Pittsburgh regional safety meeting, of the Portland Cement Association, April 17, 1931.

childhood it starts with the handling, tearing apart and building up of material things. And as individuals grow this creativeness is identified in those who become craftsmen, surgeons or engineers. When a person has this marked tendency to creativeness and physical creativity, it is dangerous to his personality to be thwarted. The trouble so often is that people seem lazy because they have not found the kind of outlet which is for them a realization of their creative tendency. Accident prevention provides a means of allowing such a person this realization under intelligent control.

Curiosity. The "monkeying around" type of fellow is recognizable in any group. The fellow who does not know what it is all about, but is always ready to find out by selecting the most dangerous localities for his investigations. This sort of individual has become an adult by growth but his mind has retained many of the attributes of childhood. Proper education and instruction will do much to remove the hazard of this characteristic.

Sex. The situation surrounding the worker should be such as to assure the possibility of a normal sex life. Many of the individual problems indicated by restlessness, neurasthenia or depression, and all sorts of nervous and mental afflictions, arise more from sex causes than is generally appreciated. The pursuits, activities and disappointments that occur in this connection are a fruitful source of disruption, at one time or another, in the lives of many people. Worry, mental detachment from the work at hand, are potential causes of so-called carelessness, thoughtlessness or inattention. Many a serious accident may be traced to sex. The causes are often very subtle and not readily recognizable, but the safety director with his heart in this work and his ear tuned to the hearts of his fellows may often identify discord before it develops beyond control and save a good employe for his company and the cause of safety.

Pugnacity. The tendency towards pugnacity does not necessarily mean personal combat. It means rather the desire to overcome any resistance or obstacles in our way. Instead of being something to suppress, pugnacity is an asset to be utilized. The problem is to direct this energy into useful, constructive channels. This energy may be devoted to methods of competition wherein the pugnacious individual may be allowed to expend his energies in overcoming the laxity of others associated with him.

The play desire. This desire in an individual prompts him to random, purposeless, irresponsible activities which are far removed from the responsible and sober setting of the conduct of his fellow workmen. These activities may often become a menace to their safety. Fortunately this individual is easily recognized and may be either segregated or eliminated as a factor in the organization.

Gregariousness. By this I mean the desire of people to associate with one another or in groups. This desire gives the individual comfort in the presence of his fellows, making him fearful of prolonged solitude, making him highly susceptible to the wishes, emotional states and beliefs of his fellows, making him more suggestible to the claims and advice of his group leader, making him want to enjoy activity with and in his group. This factor is to be understood only as one realizes that the individual is at practically all times as much being acted upon as he is acting. A person acting together with others—in a mass meeting or in a committee—takes on usually a quality of sensitiveness and suggestibility which modifies greatly what is spoken of as his independent judgment. The safety director should realize that there is a technique for utilizing this characteristic, by knowing his objectives beforehand and encouraging open debate and expression of views at committee meetings, and then thinking how the differing thoughts of all can be carried forward to a new idea to which all will give support.

I have very briefly outlined the mental traits and characteristics found in the typical worker. All types of individuals are in your organization and it is a succession of individuals you have to influence. The same means of reaching one person with the gospel of safety may bring entirely opposite results with an individual whose nature requires different handling. You who have pledged yourselves to reduce and eliminate accidents in your plants have a very real job before you, one that cannot be done by formula, by stimulants administered to the patient at intervals. You must get out with your people and treat each individual as such, and the resulting co-ordination, cooperation and high morale will carry on and results are assured.

April Accidents in Cement Plants

CEMENT MILL and quarry accidents during April, in the member plants of the Portland Cement Association, totaled 25 lost-time and 2 fatal mishaps. During April, 1930, there were 33 lost time and no fatal accidents in the same group. Therefore, while the frequency is reduced somewhat, accident severity for the month must be considered greater than for the corresponding month last year, due to the fatalities.

One of the fatal accidents occurred in the coal grinding department. An employe was feeding sweepings from the floor of the grinding room into a screw conveyor leading to an elevator. In some manner an explosion occurred in the elevator, resulting in burns to the employe from which he died. The cause of the explosion was not reported, the supposition being that it had not been determined.

April accidents for eight years

In the other fatal accident of the month a rock mine foreman was struck by a rolling rock, causing him to fall about 80 ft., from the throat of the shaft to the bottom of the stope. This mishap may be attributed to the condition of the rock at the surface of the shaft. At that point the rock is broken and seamed with clay, making it deceptive and difficult to detect loose rock.

Two of the lost-time accidents suffered during the month involved slight permanent disabilities. A packer, attempting to adjust a blade in a packing machine before it had ceased rotating, caused injuries necessitating amputation of first and second phalanges of index finger. Thirty days' time was lost. A quarry laborer thrust a hand between drawheads while coupling dump cars, badly mashing three fingers. Two joints of one finger had to be amputated.

At the end of April 96 plants remained free from accident since January 1, as against 80 plants similarly free during the corresponding period last year.

Accidents per Million Barrels Lower

Statistics covering accidents per million barrels of cement manufactured during 1930 in plants of Portland Cement Association members show a decrease. The total number of lost time, permanent disability and fatal accidents per million barrels produced were as follows:

January	2.54
February	3.31
March	3.38
April	2.52
May	4.16
June	2.15
July	2.92
August	3.31
September	2.77
October	2.85
November	2.00
December	1.92
Average for year	3.38

Figures showing accidents per unit of production indicate a consistent decline since January, 1925, when the rate for that month was 28.8.

Safe Practices with Commercial Explosives

ACCIDENTAL EXPLOSIONS are preventable and information on how to prevent them is contained in Pamphlet 28, issued by the National Safety Council, Inc., Chicago, Ill.

The first admonition given is that persons handling explosives should acquaint themselves with all the laws governing their operations in the state or community where they operate.

Commercial explosives are then classified as low explosives, high explosives, and igniters and detonators. A description of the physical properties and characteristics of each explosive in these classifications is given.

Selecting the proper explosive is important, says the bulletin, both from an economical as well as a safety standpoint. In selecting an explosive for quarrying and open-air operations, practically any of the commercial explosives can be used, chosen to meet the varying conditions of moisture, size of breakage, etc. In soft rock quarries and gravel pits a low strength, bulky explosive is often suitable. In hard rock a dense, fast explosive, such as high strength gelatin, is often necessary.

For underground work where there is poor ventilation the United States Bureau of Mines has conducted tests which prove that gelatin dynamite, when fresh and when properly detonated, is highly satisfactory. Ammonium "permissible" explosives are also found to be satisfactory.

Tamping sticks and blocks should always be of wood. Steel or iron pipes or cleaning spoons should never be used. The tamping stick should fit loosely in the hole, as there is always danger of injuring the fuse or lead wire. During storage explosives should be protected against excessive heat (90 deg. F. maximum), moisture, fire, lighning, projectiles and theft. For storing detonators a separate small building should be provided at a safe distance from the magazine containing the high explosives.

The magazine should be locked and solely in charge of a trustworthy person who receives, stores, and removes the explosives. In case the magazine floor becomes stained with nitroglycerine it should be thoroughly decomposed with a mixture of ½ gal. of water, ½ gal. of wood alcohol and 2 lb. of sulphide of sodium. Before a magazine is altered or repaired all explosives should be carefully removed and the magazine thoroughly washed. It is preferable that magazines be located on sandy soil, where possible. A lean concrete consisting of one part portland cement, three parts sand and five parts gravel is recommended for the construction of magazines.

Frozen dynamites should never be used until completely thawed, and thawing should follow recommended practice.

General recommendations are that the entire handling and firing of explosives be done by carefully selected and trained men; where dangerous gases or dusts are present, wet down the face of the operation just before firing; stay away from the face after a shot has been fired long enough to permit poisonous gases and smoke to disperse, and excessive dust to settle; explosives should never be handled by men carrying open lights; no one should carry ordinary matches into a mine or near any operation where explosives are handled; never withdraw a shot that has been misfired; never take more than one day's supply of explosives into a mine or to the working operation; containers that have held explosives should be destroyed at once; care should be exercised when handling explosives near electric wires, especially if the explosives are in metal containers.

June Campaign in Cement Mills

Annual Safety Drive Opens with Great Promise

THE fifth consecutive June No-Accident Campaign in the member mills of the Portland Cement Association opened at sunrise June 1, with 100% of the workers and officials enrolled, so far as can be ascertained from reports received at association headquarters.

While the total number of mills cooperating in the campaign is a few less than last year, due largely to the smaller number in operation, enthusiasm runs as high as ever and chances for a real "no-accident" month are considered better than during any previous June. The number of mills without lost-time accident from January 1 to June 1, 1931, is greater even than for the corresponding period of 1930.

At practically all of the participating plants, mass meetings were held on June 1 as the official "start off" feature of the campaign. At many of these, public officials and prominent local citizens joined with the company management in an effort to bring the interest of the employes to the maximum. The official June No-Accident flag was hoisted to the masthead of each plant pole with appropriate ceremonies at sunrise on June 1 or as soon thereafter as convenient.

It will fly night and day as long as the plant remains free from lost-time or more serious accident or until it is replaced by next year's June flag, on June 1, 1932. The flag raised the first day of this month is considered the handsomest selected for this purpost to date. It carries a green field on which is a white circle and within it a green cross. The significance of the design has been told to cement mill operating men.

International Conference on Silicosis

CONCENTRATION of dust, time of exposure and percentage of free silica were determined as factors affecting development and progress of silicosis at an international conference held in 1930 at Johannesburg, South Africa.

Silicosis is an occupational disease resulting from exposure to dust containing silica with small percentages of other minerals. It may be contracted in from three months, under the most serious types of exposure, to 20 years, where exposure is limited. The final stage of this disease is tuberculosis. In South Africa, where effort has been directed since 1902 to eliminate this industrial hazard, the number of cases is now declining. Other countries are several years behind South Africa in this control and silicosis is mounting in them.

The most hazardous occupation reported is sand blasting, where records show employes have contracted the disease in three months. Other hazardous occupations in the rock products industry include drilling, blasting and transporting of rock, silica milling and the production and processing of asbestos.

Once acquired, though a worker changes to an occupation where this hazard does not exist, the disease continues.

Preventive measures consist in eliminating dust conditions through improved ventilation, dust elimination systems and methods, and protective devices for employes. Treatment has not required the removal of a patient from his customary employment.

In the United States some provision is made by the federal government to provide for those who have contracted this disease. Certain states have laws granting compensation and others are now considering such legislation. In most countries some governmental assistance is rendered in cases of disability. Little responsibility has been assumed by industry in such relief.

Fig. 1. View of gravel dredge and screening plant, looking upstream

Modern Sand and Gravel Suction Dredge

Direct Diesel-Engine-Driven Pump with Electric Power for Auxiliary Equipment

By Victor J. Milkowski
Engineer in Charge of Dredge Department, Morris Machine Works, Baldwinsville, N. Y.

THE LATEST PRACTICE in modern sand and gravel suction dredge design and equipment is exemplified in the plant built on the Osage River near Bagnell, Mo., by the Stone and Webster Engineering Corp. The past tense is used throughout the description because with the completion of the hydroelectric development the plant was dismantled and the equipment sold.

The nature of the deposit and the prevailing conditions were such as to make it most practical to dredge the material with a hydraulic dredge, loading it into barges alongside, and towing the loaded barges to an unloading dock opposite the screening plant. There the material was unloaded by a clamshell bucket, and elevated to the top of the screening plant by means of a belt conveyor.

To make the operation positive and absolutely reliable, the dredge was completely equipped with a revolving cutter on the suction, a five-drum hoist, and operating spuds. Diesel power was used to make the dredge self-contained and free from power interruption.

Pump

The pump was a 15-in. suction, 15-in. discharge heavy duty Morris gravel pump, with all wearing parts of manganese steel. This pump was direct-connected to a Diesel engine through a magnetic clutch coupling. The engine was a 460-hp. Busch-Sulzer, operating at 277 r.p.m. Between the engine and the magnetic clutch coupling through which the dredging pump was driven, there was mounted a 150-kw. generator supplying current for the auxiliaries. This arrangement permitted shutting down the dredging pump by disconnecting the magnetic clutch without shutting down the engine and the generator.

The cutter ladder was 55 ft. long from the center line of the hinges to the end of the cutter, and was driven by a 60-hp., 600-r.p.m. variable-speed motor, mounted directly on the ladder. A worm-gear reduction unit was used between the motor shaft and the cutter shaft, with a ratio of 30 to 1. The cutter was of special construction with renewable manganese-steel cutting edges, and it acted at the same time as a screen to keep out the oversize material from the pump suction.

The hoist was a five-drum Morris dredge hoist driven by a 40-hp., 900-r.p.m. variable-speed motor. One drum was used for raising and lowering the cutter ladder, two drums for operating the forward swinging lines, while the two remaining drums were used for operating the two spuds at the stern, these spuds being round timbers 23 in. in diameter.

One 3-in. double-suction, horizontally split Morris pump direct-connected to 10-hp. motor was used for priming and for general uses on board the dredge; while a 6-in. double-suction, horizontally split Morris pump direct-connected to a 100-hp. motor

was provided to supply water to a monitor for jetting down the bank ahead, if that should be found necessary.

Steel Hull Built in Eight Sections

The design of the hull received special attention as the facilities for building the hull at the site were rather limited, and in addition it was desired to have the hull made so that it could be taken apart readily and shipped to another location. The hull was, therefore, constructed of eight sections or pontoons, these pontoons being built complete in the shop, and launched and bolted together at the site. The bolts for connecting the different sections of the hull together were arranged so that when the pontoons were floating light these bolt holes were above the water. Two of the pontoons were located in the center, each being 10 ft. wide and 52½ ft. long, while the pontoons on the sides (which were three in number on each side) were each 10 ft. wide and 35 ft. long. The overall dimensions of the hull were approximately 105 ft. long, 30 ft. wide, and 5 ft. 6 in. deep. The engine, the generator and the dredging pump were mounted on the aft central pontoon and were, therefore, on a single rigid foundation. Two fore and aft trusses were installed to aid in maintaining the alignment between the different sections of the hull, and to provide gantries and overhead trolley track.

Shore Plant

The material was loaded into barges alongside through a screened trough designed to partly dewater the material, and to check the velocity of flow so as to deposit the material on the barges with a minimum of disturbance and loss (see Fig. 3). The barges were flat-deck scows, holding about 115 cu. yd. of material. The loaded barges were towed to an unloading dock opposite the screening plant, where the material was unloaded by clamshell buckets into a hopper, and from there it was carried to the top of the screening plant by means of an inclined belt conveyor.

At the top of the screening plant, the material was discharged into revolving screens, which separated out the sand, undersized gravel and oversized gravel, the oversize being passed down through an ejection chute to a car. The gravel of acceptable size was delivered to log washers where it was thoroughly cleaned of all silt, clay and sticks and delivered to the bins. The small sizes, together with the sand, were delivered to vibrating screens where the sand was separated and discharged to a sand classifier, and then into the storage bin. The material retained on the vibrating screens was delivered to log washers from which one-half was delivered to the gravel storage bins and the other half to a crushing plant, which reduced it to sand size, after which it was rescreened and delivered to the sand classifier. Cars were spotted on tracks on either side of the storage bins and filled by means of gravity chutes.

Produced Over Half Million Yards of Materials

Ordinarily it required about 20 min. for the dredge to load a barge holding 115 cu. yd., although it was designed for capacity of only 180 cu. yd. per hr. The maximum 24-hr. output for the plant was 4784 cu. yd. of sand and gravel. The plant was placed in operation on April 18, 1930, and was operated until December 6, 1930. The total amount of material produced was 567,417 cu. yd., of which 163,529 cu. yd. were sand, and 403,888 cu. yd. gravel.

The general design of the dredge was prepared by George B. Massey. All of the equipment for the dredge was supplied by the Morris Machine Works. The construction of the plant was in charge of H. C.

Fig. 2. The dredge being assembled

Fig. 3. Dredging equipment at gravel plant

Laville, superintendent of construction for Stone & Webster, Inc.

Due to its completeness, and due to the design and construction which permitted of dismantling the dredge readily and shipping it to another location, ready sale was found for this dredge upon completion of this work.

Why the Plant Was Built

In the case of the Osage hydro-electric development, for which this plant supplied aggregates, it was found that the regular commercial plants in that vicinity did not have sufficient capacity to meet the requirements of the concreting program, and that with the exception of one rather small plant all other possible sources of supply were located at such distance from the site that heavy freight charges and unreliable deliveries would be involved. It was decided, therefore, to construct and operate this sand and gravel plant in connection with the project in order to secure a reliable source of supply.

Good Deposits Available

Investigations showed that suitable deposits of sand and gravel existed in the Osage River about four and one-half miles downstream from the site of the dam, and about one-half mile up stream from the town of Bagnell. A suitable site on the shore opposite was also available for the screening plant, and from there a construction railroad could be run to the job without the use of any intervening trunk line trackage.

Unique Service by Kentucky Producer

A UNIQUE and beneficial service has been rendered contractors bidding on Kentucky state highway work during the past year by the Central Rock Co., Lexington, Ky.

This service consists of tabulating and posting on a large bulletin board, in front of the building in which the letting is held, a complete list of bidders, types and prices.

At the same time these bids are tabulated for the bulletin board, a separate list is made of the two low bidders on each job; and these are taken to an adjacent room where they are typed on a mimeograph stencil. This stencil is kept in the typewriter until a sheet is filled. It is then put on the mimeograph and the sheets are run off while another stencil is being prepared.

At the conclusion of the letting, the last stencil is run off, and the sheets are bound with a neat blue cover, called the "Blue Sheet," carrying the company's advertising. They are then given to the contractors and others interested, upon presentation of a signed card, given them as they enter.

This system has been so thoroughly worked out that as soon as the last bid is read, and as the contractors are leaving the room, they are handed the "Blue Sheet" showing the low bidders. The entire operation is handled by the office staff.

This service was first inaugurated by the Central Rock Co. a little more than a year ago, and has been very successful from the first. A large number of requests for the "Blue Sheet" are received by mail after each letting.

As a result of this service, the company enjoys the good-will of the contractors, and receives many favorable comments.

Montana Phosphate Producer Gets Canadian Contract

C. E. LARABIE, William Anderson, William Janney and W. J. Paul recently negotiated the sale of several cars daily of Powell county, Montana, phosphate with a Canadian smelter at Trail, B. C.

This contract is for daily shipment of ores for a long duration and makes the Anderson phosphate mine a permanent operating concern.—*Deer Lodge* (Mont.) *Post.*

Sand and Gravel Association Appoints Representative

ANNOUNCEMENT is made of the appointment of Joe W. Kelly as district representative of the National Sand and Gravel Association, with headquarters in Minneapolis, Minn.

Mr. Kelly will co-operate with state highway departments, producers and others in his new work. He has been associated with the Portland Cement Association for several years in research work. This appointment was effective June 1.

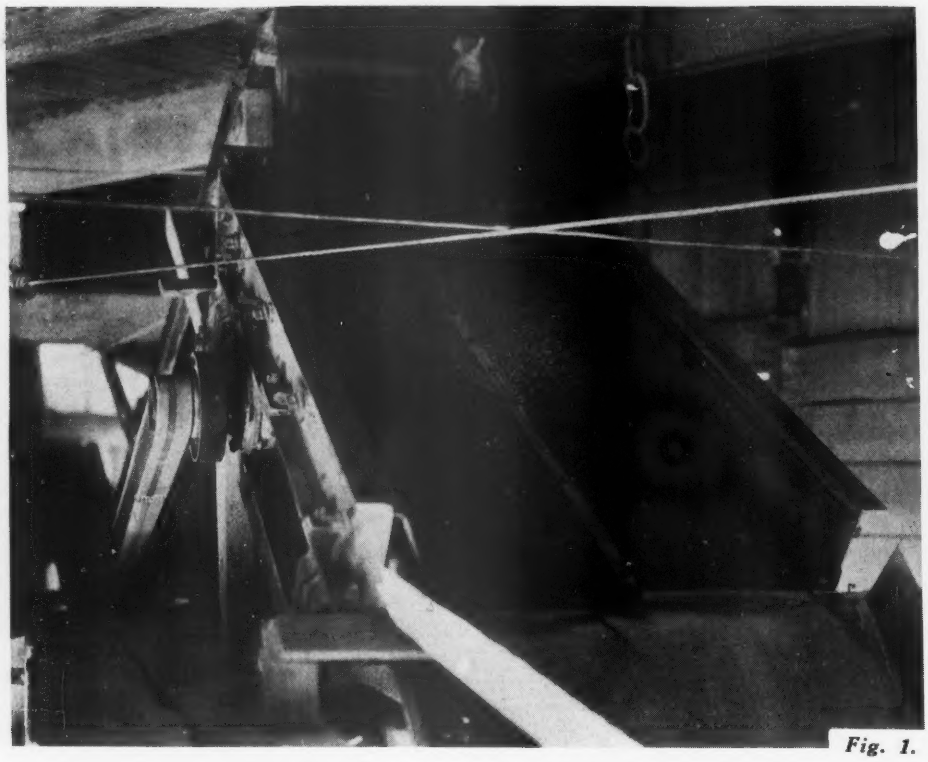


Fig. 1.

Vibrating Screens for Stone

By H. L. Strube
Engineer, Link-Belt Co., Philadelphia, Penn.

THE DEMAND for clean material, brought about by more rigid specifications and the competition of properly washed gravel, makes it imperative for stone producers to remove all crusher dust from their rock, as well as to do more accurate sizing.

When thinking of screening problems there are several common types of screens that immediately come to mind, but of these there is one—the vibrating screen—that has proved itself superior in many ways for the more accurate grading of the smaller sizes of crushed stone, and it is to the screening of these sizes that this article is confined.

In the words of a customer: "For handling stone, 2½-in. and under in size, there is no real comparison in the results obtained between the vibrating screen and the revolving screen we formerly used."

It might be mentioned that in one installation of the Link-Belt vibrating screen handling crushed limestone, the quarry manager pointed out three advantages of this type of screen as he saw matters, based on his wide experience: (1) Saving of power over that of other types of screen; (2) lower maintenance expenses; (3) less space occupied.

More recently the president and manager of this concern has written that any wire cloth used on these screens was good for the screening of approximately 25,000 tons.

Fig. 1 shows a single deck 3-ft. wide by 5-ft. long Link-Belt vibrating screen with 6-mesh cloth, which is used for handling limestone grit, and which enables the user to market 35% of this grit at from two to three times the price formerly obtainable for unscreened grit. The feed is direct from a portable belt conveyor. The greater demand for the screened grit, and the higher price obtainable for it, are factors that have made this screen installation a highly profitable investment.

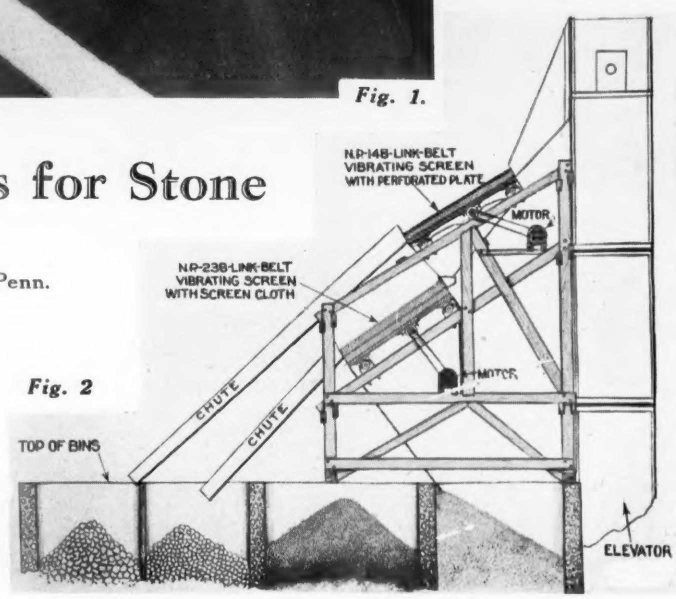


Fig. 2

Fig. 2 shows an installation of two vibrating screens located over storage bins. The upper screen, which is of the single-deck type with a perforated plate screening surface, is fed stone 2½-in. and under in size from a bucket elevator. Material that passes through the perforations of this screen is delivered to the double-deck lower screen with wire-cloth screening surface.

Thus four sizes of stone are made, but by substituting screening surfaces having different size perforations, other sizes of stone can also be produced.

This stone plant operator is pleased with the quickness with which the perforated plate or the screen cloth can be replaced on the vibrating screen when other sizes of stone are ordered than those regularly stored and called for. This change can be made in a few minutes.

Fig. 3 shows the removal of the screening frame of the average vibrating screen is a simple and inexpensive operation. This is an advantage the vibrating screen has as compared with changing screen plates on a revolving screen.

The pictures show the simplicity of construction of this type of screen and its clean, unobstructed screening surface. The drive is a mechanically operated device, reduced to the simplest possible mechanism, i.e., one moving part which rotates in large, oversize ball bearings.

In handling smaller sizes of stone, the uniformly mechanically vibrated screen will produce a better separation of the stone, with greater efficiency, within less space, with less power, with smaller upkeep and with less supporting framework than any other type of screen used.

In the vibrating screen every square inch of screening surface is working, whereas not over one-third of the revolving screen surface is in contact with the material to be screened. In a revolving screen the material is not stratified in the same manner as in the vibrating screen. With the former, the larger pieces run faster than the smaller, and remain along the lower edge of the material where the most effective screening should be done. This means that the oversize pieces are continually in the way of the undersize and prevent effective screening.

Fig. 3

Next Road Show at Detroit, Cleveland or Philadelphia

INCREASED ROAD and street activities through the co-operation of various interested associations was the keynote of the annual meeting of the American Road Builders' Association in Washington on May 14 to 16. Plans for the coming year were made, committee chairmen appointed, and details settled for the coming annual Convention and Road Show to be held in January, 1932.

"The depression of the past year has not in any way affected the operation of the American Road Builders' Association," declared W. A. Van Duzer, president of the association for the past year, who presided at the meeting of the board of directors. "The association is now engaged in more activities than formerly and is carrying on joint work with more associations that at any time previously."

Co-operative work now in progress between the American Road Builders' Association and the Association of State Highway Officials, the U. S. Department of Commerce, the Highway Research Board, the Associated General Contractors, the National County Highways Planning Association and other organizations was approved and provision made for expansion of its scope.

The report of the ways and means committee of the manufacturers' division approved at the January meeting was adopted by the board of directors of the association.

The 1932 Convention and Road Show will be held in Detroit, Cleveland or Philadelphia, according to recommendations of the executive committee of the manufacturers' division. The board of directors left the selection of the city to the discretion of the executive committee of the association.

The County Highway Officials' division recommended nation-wide planning of all public works several years in advance. Activities for the coming year include in the program studies of uniform county planning with uniform enabling acts for districts, methods of extending state aid to counties, a manual of county planning, methods of promoting county bond issues, specification forms, and widening and reconstructing highways.

The City Officials' division outlined the committee work for the coming year on five subjects: design and construction, pavement financing, maintenance, traffic, and airports.

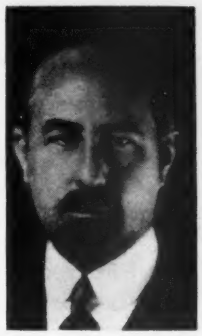
The annual report of Charles M. Upham, secretary and engineer-director, stated that the association had been especially active during the past year and all activities had been centered toward standardization of materials, equipment and methods, and the continuation and increase of highway programs —city, county and state.

Activities for the coming year include extensive co-operative work with many associations, with stress on the expansion of highway programs to provide more highways to meet traffic requirements. Research and investigative work on the economics of highways will be continued and expanded.

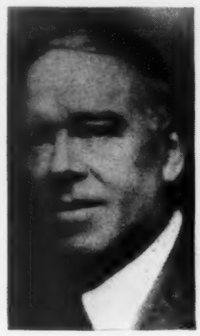
Merger of Equipment Manufacturers Announced

ANNOUNCEMENT IS MADE of the union of the Dorr Co., New York, N. Y., and Oliver United Filters, Inc., San Francisco, Calif., effective June 1. The new organization is to be known as Dorr-Oliver Corp., under the joint management of Messrs. Dorr and Oliver.

Dorr-Oliver Corp. will function through its two wholly-owned operating units, a new Dorr Co., Inc., and a new Oliver United



J. V. N. Dorr



Edwin L. Oliver

Filters, Inc. Mr. Dorr and Mr. Oliver will head their respective companies and with the aid of their present executive and technical staffs will continue on behalf of Dorr-Oliver Corp. the businesses which they have initiated, organized and expanded.

The Dorr Co. is a well known organization in the fields of agitation, classification and sedimentation through its equipment, built up around the original inventions of its founder, John V. N. Dorr; and the Oliver United Filters, Inc., is equally well known in the field of filtration through the inventions of Edwin L. Oliver and E. J. Sweetland. Their organizations are worldwide.

Mr. Dorr is a graduate of Rutgers University and has since received honorary degrees from this same university. His experience has been extensive in the metallurgical, chemical, industrial and sanitary fields. He has developed many improvements in processing and equipment in those fields in which he has been active.

Mr. Oliver is a graduate in mining engineering of the Univesity of California. His early experience, following graduation, was in the metallurgical field. While engaged in this work he developed the Oliver continuous filter for handling cyanide slimes. This development met with such success that he organized a company to manufacture them. Since that time he has developed their application to many other industries, including the portland cement industry.

Oregon Pipe Manufacturers Protest Discrimination

PROTESTING against alleged discrimination of Multnomah county, Oregon, against the use of Oregon-manufactured concrete culvert pipe and in favor of eastern metal pipe, Clyde L. Grutze, manager of the Concrete Pipe Co. and officer of the Northwest Concrete Products Co., and R. A. Collins, vice-president of the Collins Concrete Pipe Co., addressed a letter of protest to the county commissioners May 20, saying:

"We are unable to ascertain why this discrimination against concrete culvert pipe is made. When culvert pipe is needed the purchasing agent of Multnomah county does not even request prices on the concrete culvert pipe manufactured in Oregon, exclusively of Oregon products. The companies are Oregon corporations.

"The raw products such as sand, gravel and cement are purchased from Oregon companies. At present, when every effort is being made to employ local labor, it seems foolish to us to go east to get the corrugated metal and bring it to Portland, to assemble it for culvert pipe work when we would employ local labor in manufacturing the cement for the pipe, local labor in taking the sand and gravel out of our rivers and local labor in the actual manufacture of the concrete pipe.

"In checking over prices charged to the county for metal pipe it was noted that the prices are very much higher when pipe is purchased without competition than the prices quoted to contractors on highway jobs where concrete and metal pipe compete. It was also noted that when competitive bids are called for, a thinner gage of metal pipe is included in the specifications than is generally used."

Roadmaster Buck and Purchasing Agent Cooper were asked by the commissioners to investigate and make a report to the board on the alleged discrimination.

Associated General Contractors Plan Legislative Program

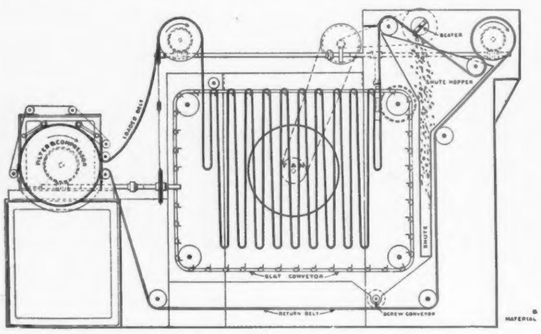
PROMULGATION of a national legislative program to be aggressively supported by organized general contractors at the next session of Congress was undertaken by the executive board of the Associated General Contractors of America.

This program will include a constructive amendment to make the wage law workable and equitable and at the same time assure a living wage to construction labor. Bills for the recodification of government contract statutes and for authorization of a permanent national construction census also will receive the active support of the association, while it will give favorable consideration to plans for pushing legislation in the states for long-term advance planning.

New Machinery and Equipment

A Drier Feed for Cement Kilns

FILTRATION Engineers, Inc., Newark, N. J., has introduced a drying system for slurry in the cement plant. A combination of the "FEinc" vacuum continuous filter and a Proctor recirculated air dryer, it is said, is used to perform this drying function.



Section of slurry drying system

The manufacturer says a feature of this system is the reinforcement of the cake as it is formed on the filter and the conveyance of this sheet through the dryer, where it is hung in festoons. Provision is made to dry cakes of various thickness, the manufacturer states.

Advantages gained by drying slurry before feeding it to the kilns are claimed to be the reduction or elimination of mud rings and spill-back and that the clinkering zone is moved back in the kiln permitting faster rotation.

It is said drying may be accomplished by utilizing waste heat from the kiln whether or not waste heat boilers are in use in the plant.

Crawler Type Hydraulic Bottom Dump Wagon

THE EUCLID Crane and Hoist Co., Cleveland, Ohio, presents the "Track Wheel" hydraulic bottom dump wagon for heavy haulage. According to the manufacturers, the tractor driver has complete control of dumping and door closing operations from his driving position. Hydraulic pressure for dumping and all door closing operations is supplied by the Euclid hydraulic pump attached to the rear of the tractor.

The door lifting jack is located inside the tubular section of the wagon drawbar to protect the jack and to keep out dust and dirt.

These Euclid wagons are designed to operate either with the hydraulic pump or by hand. To convert from hydraulic to hand operation it is necessary simply to clamp the door cables together over the front guide sheave.

Euclid wagons are built in 5½, 6, 7 and 8 cu. yd. capacities. The hydraulic model is identical with the hand wind model with the exception of the hydraulic pump and lifting jack which are added to this wagon.

Door lifting jack is inside wagon drawbar

New One Yard Excavator

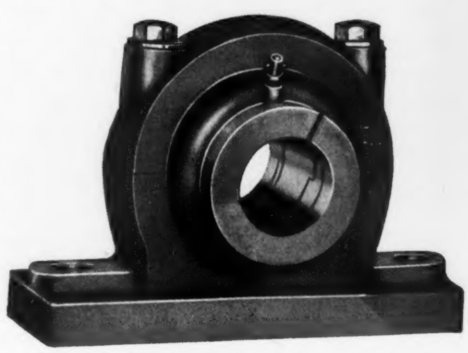
A NEW IMPROVED, full revolving 1-yd. excavator, known as the P. & H. Model "500," is just announced by the Harnischfeger Corp., Milwaukee, Wis. This machine is now being put into production to be ready for delivery soon.

This unit furnished with gasoline, Diesel or electric power

The "500" is said to follow the general P. & H. design with a number of added refinements. Main frames are unit alloy steel castings. Wearing parts are of alloy heat treated steels. Drums are in tandem and operate through the P. & H. power clutch control. Gasoline, Diesel or electric motors provide power whether machine is used as shovel, dragline, crane, chamshell, hoe or skimmer.

New Self-Aligning Pillow Block

TO MEET THE DEMAND for a rugged anti-friction bearing for service where loads exceed those ordinarily met in line shaft service, Sprout-Waldron and Co., Muncy, Penn., announces its "Hyattized" ball and socket self-aligning pillow block.



Equal distribution of bearing load is claimed

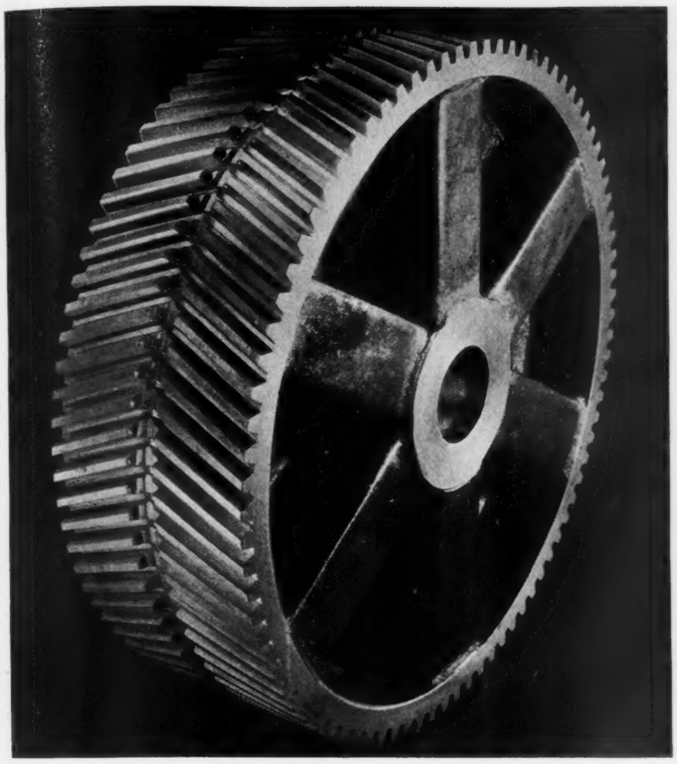
The manufacturer says this pillow block consists of one Hyatt heavy-duty roller bearing with solid hardened and ground outer and inner races, mounted in an accurately machined heavy cast-iron ring which is turned on the outside to a perfect sphere. This ring containing the bearing is mounted in a heavy two-piece cast-iron housing with internal machined spherical seat. The complete unit is thus made self-aligning and equal distribution of the bearing load is secured along the entire roller.

Welded Gears

THE PHILADELPHIA GEAR WORKS, Philadelphia, Penn., announces the development of a line of welded steel gears ranging in diameters from 15 to 168 in., said to be especially adapted to heavy duty service.

The manufacturer says these gears have approximately 50% greater tensile strength than cast steel gears.

Using homogeneous rolled 1040 S. A. E. steel plate throughout, the rim is cut in the form of a solid ring from a flat plate by means of a gas torch. A solid rolled steel disc forms the web of the gear, against which channel shaped pressed steel arms are welded on both sides. The hub is a forged steel bar drilled to receive the shaft. Hub, web, arms and rim are welded into the fin-



Made in diameters from 15 to 168 in.

ished structure and then normalized before machining, to prevent subsequent warping. It is said the welded gear weighs about 10% less than cast steel gears.

This manufacturer says its entire line of cast steel gears is now also available in welded steel construction. Likewise, heavy duty speed reducer units, formerly using cast steel gear assembly, are now offered with "Philweld" gears, if desired.

New Combination Multi-Speed Drive and Motor

A MULTI-SPEED reduction gear unit built in combination with a standard alternating-current motor has been developed by Roy T. Wise, consulting engineer, Westinghouse Electric and Manufacturing Co., Pittsburgh, Penn. Constructed to give four different speeds to the output shaft at constant horsepower, this unit, known as the Westinghouse-Wise multi-speed drive, is applicable to industrial operations which require drives providing more than one speed. With this drive, it is said, the speed of the driven apparatus may be changed instantly while the motor is running at full speed and under full load. All gears are constantly in mesh, and in no way can the operator injure the unit by changing speeds at any time. This gear is mounted on a standard squirrel-cage Westinghouse induction motor.

Ball bearings are used in both motor and gear unit. The gearing in the first reduction, or drive from the motor to the countershaft, is of the single helical type and the other gears on the countershaft and those on the output shaft are of the spur type. All gearing is forged steel and is given the Westinghouse-Nuttall treatment. A simple but positive splash system is provided for lubricating both the gearing and the bearings. Oil is picked up by the gear teeth in the lower part of the case and delivered to mating gears and all other moving parts. An oil gage is provided for checking the oil level.

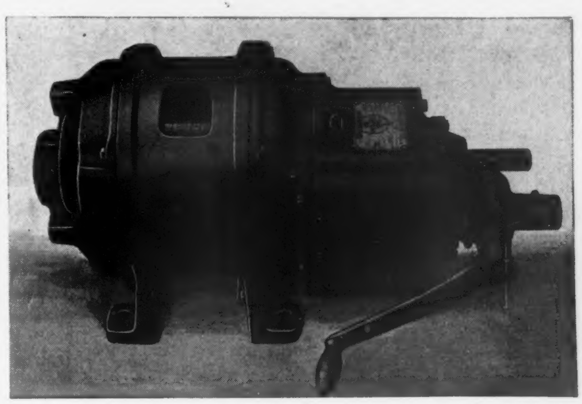
According to the manufacturer, this new unit simplifies installation, less space is required, and only one mounting bracket or foundation is needed, since the unit is applied exactly like any motor.

This multi-speed industrial drive is particularly adaptable to machines on which pieces of both large and small diameters are turned. A possible application of this equipment in the rock products industry is on a conveyor where the quantity of material to be delivered varies. The conveyor drive might advantageously be variable in speed.

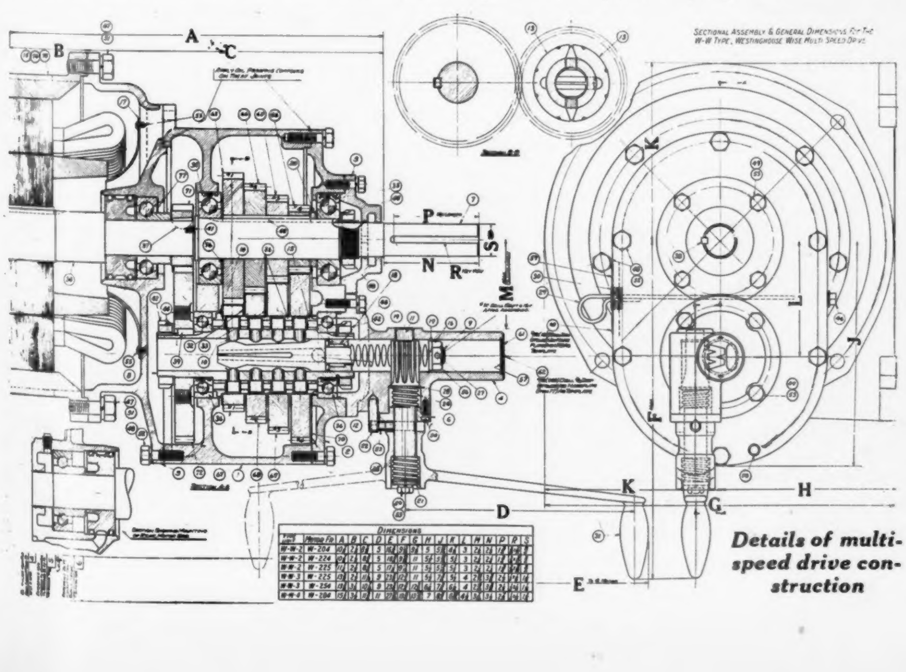
This multi-speed drive is offered in three units, ranging in rating from ½- to 7½-hp. It is said the four speeds available in the gear drive itself, plus the availability of motors giving different driving speeds, make it possible to choose a combination that covers a wide range of speeds.

Following is a detailed description of the drive as given by the manufacturer. It is illustrated in the accompanying cross-section drawing.

On the drive shaft (34) is keyed pinion (71). This pinion, when the motor is in operation, drives gear (72), which is keyed to the hollow drive shaft



Unit is attached direct to motor



Details of multi-speed drive construction

(8). On this shaft are mounted four gears (Nos. 67 to 70 inclusive), each carrying their own internal clutch. A section of this clutch is shown through BB. These gears are in constant mesh with gears on the driven shaft (63 to 66 inclusive). The unit is in driving position for the low speed. This position was obtained by moving handle (31) which carries pinion (11), actuating rack (16), which forces spring member (9) between wedges (10).

In the section through BB it can be clearly seen that these expanding wedges have forced the halves of clutch (13) out against the inner bore of the gear, causing it to be clutched to shaft (8), this gear being in constant mesh with gear (63). Shaft (7) is then driven.

When it is desired to return to a neutral position, handle (31) should be rotated so as to move pinion (11), carrying with it rack (16), which moves spring member (9). It will be noted that there is room between the driving wedges and the high point of this spring to return to a neutral position without engaging either the set of expanding wedges that was just engaged or the next set of wedges.

When it is desired to change to the next speed,

the same operation is necessary; namely, rotating handle (31) to move rack pinion and spring member to engage wedges (10). These speed changes can be made while the unit is running at full speed and under full load. One complete revolution of handle (31) completes a cycle of speed changes and these changes can be made almost instantly from high to low or low to high.

Pins (22 and 23) serve as stop pins so that overtravel of the rack and pinion is prevented. Plate (6) has notches to indicate the correct position of the rack and pinion for any desired speed.

Hard-Facing Products Announced

A GROUP OF NEW hard-facing products for application on friction surfaces is announced by Armite Laboratories, Los Angeles, Calif. These are for application with the electric arc and by the oxy-acetylene method.

It is said the laboratory has developed several grades of inserts and compounds ranging in size from the smallest 20-mesh to ½-in. diameter for application to drill bits, power shovel teeth and for other services where inserts are desirable.

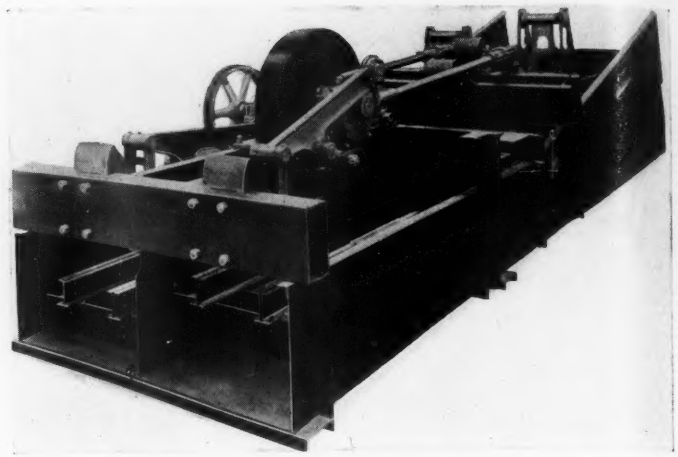
Another new product announced is a tungsten carbide compound that can be applied direct to any type of steel and by special application to manganese. The manufacturer states this product, known as "Armite Arcweld," is applied with an electric arc using a negative carbon electrode. The same material in tube form, known as "Armite Autoweld," is also being introduced.

The laboratory, in addition to manufacturing hard surfacing materials, has also developed a hard-facing rod claimed to be of lighter weight than rods heretofore placed on the market so that more surface is covered per pound. This hard-facing rod is made in three grades of varying hardness.

Announces New Classifier

A NEW TYPE of mechanical classifier is announced by the Dorr Co., New York, N. Y. Mechanical improvements in design and an entirely new type of head motion have extended the field of operation, it is said, and permit the use of speeds 50% higher than was formerly possible.

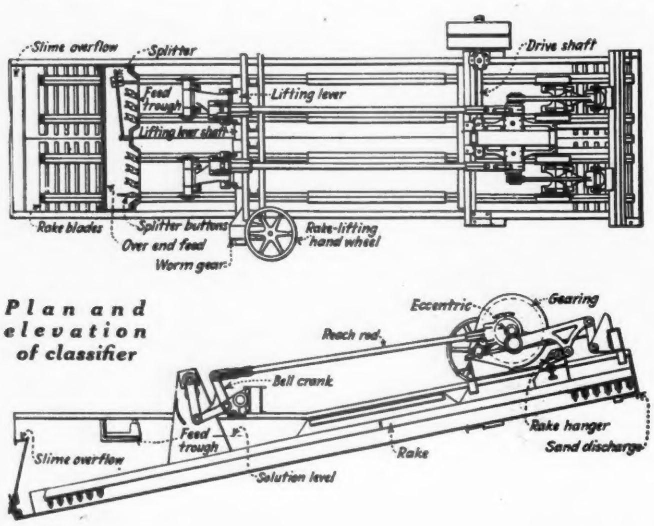
This Dorr "F" classifier, the manufacturer states, was developed in anticipation of changes in grinding and classification practice. Influences in this development were the tendency towards maintenance of larger circulating sand loads in connection with closed-circuit grinding, and the trend towards coarser separations at the primary classification stage in multiple-stage fine grinding. Both of these objectives, it is said, are attained in this classifier.



Welded construction is used on steel tank and reciprocating rake assemblies

All working parts are constructed of cast steel. Welded construction is used on the steel tank and reciprocating rake assemblies. It is said the improved head motion has permitted a material reduction in the head room required, and that both sand-raking and overflow capacities have been increased.

The Dorr "F" classifier is offered with or without the bowl for all separations from 10- to 325-mesh. Widths range from 3 ft. to 18 ft., lengths vary according to specifications of the mills with which the classifiers are to operate in closed circuit, and the raking mechanisms are furnished in the simplex, duplex and quadruplex types.



Plan and elevation of classifier

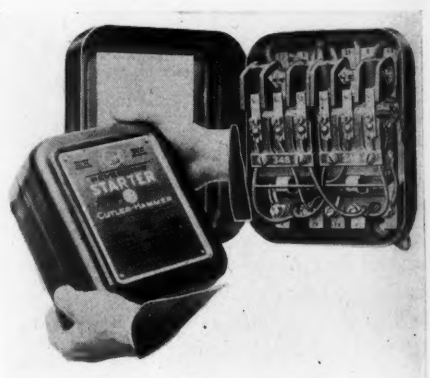
Reversing Starter for Small Motors

THE DEVELOPMENT of a new across-the-line type reversing starter for direct and alternating current polyphase motors up to 3 hp. is announced by Cutler-Hammer, Inc., Milwaukee, Wis. It is said these new starters are designed for use with motors on hoists, lifts, garage doors, small machine tools and other equipment where a half-time, intermittent duty reversing starter is required.

Reversing is accomplished by means of two mechanically interlocked magnetic contactors which are controlled from a remote point by means of a separate push-button master station.

Overall size of this new starter is 7 1/16 in. wide by 8 7/16 in. high by 4 7/16 in. deep. The contactors are a new three-pole design. The manufacturer says silver to silver contacts reduce arcing and pitting to a minimum and assure maximum current carrying capacity at all times.

These starters are furnished in two types: Type SRA is arranged for two wire control only. It has a maximum capacity of 1 hp. Type SRB can be used for either two or three wire remote control. Blowouts are provided to give maximum capacity of 3 hp.



Compact reversing starter

Announces Another New Engine

THE CONTINENTAL MOTORS Corp., Detroit, Mich., announces another new series, in four sizes, of Continental 6-cylinder, L-head engines to be known as the E-600. This group, designed for high speed and performance, yet of comparatively low weight, does not supplant any of the present models.

All of these E-600 are of 4½-in. stroke, but the bores are 3 11/16-in., 3⅞-in., 4⅛-in. and 4¼-in., with displacements of 288.3, 318.0, 360.7, and 382.9 cu. in. respectively.

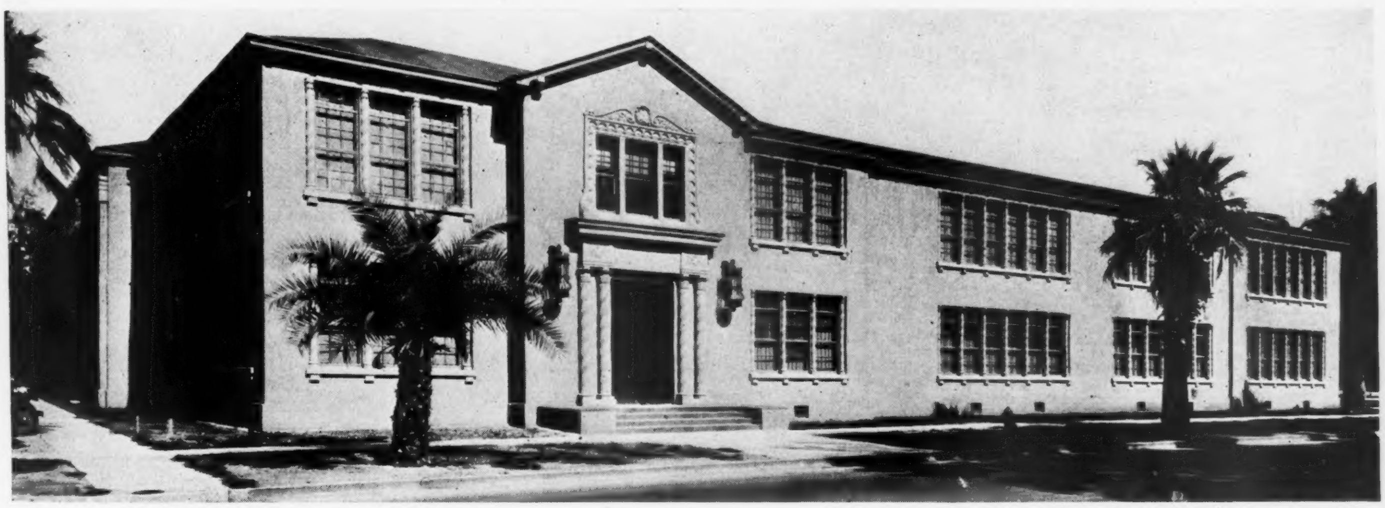
It is claimed the design has resulted in a combination of high torque characteristics over a wide speed range. Provision has been made in the basic design for all current accessories, such as oil filter, air cleaner, air compressor, etc., and for dual ignition.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Phoenix, Arizona, Is a Cement Products City

Tile, Brick, Ready-Mixed Mortar and Pipe Made by Local Manufacturers Are Much Used in Building Construction and in Irrigation Works



Junior College, Phoenix, Ariz., constructed of tile furnished by Cement Products, Inc.

DURING the past eight years and particularly during the period from about 1925 to 1929 there has been a rapid growth in the use of concrete tile for buildings in and around Phoenix, Ariz.

Of course, since 1929 this has dropped off considerably along with other building products because of the decrease in building activity; but concrete tile has been very favorably received and is much used for both outside walls and for partition walls. It has the advantage of a higher crushing strength, about 1100 lb. per sq. in. of concrete, against 900 lb. for the local clay brick; and is claimed to have a greater insulating value, which is of course a desirable characteristic in this climate.

The local deposits of sand and gravel from which the tile are made are very good, whereas the clay for brick making is not of a high quality as compared with other localities, which of course works to the advantage of the concrete product.

Some concrete brick have been made, but not to any great extent, for they cannot compete in price with the local clay brick. Also some very good poured concrete block have been made, but not at a cost to compete with other products.

The concrete tile has been used very largely in the government buildings on the Indian reservation, particularly for partition walls, and has been used on quite a number of the large one- and two-story buildings in the city, as shown by the accompanying views. These are all finished in stucco and present a very pleasing appearance.

This does not mean that most of the material used is concrete tile, for other materials are probably used for 80% of the total building.

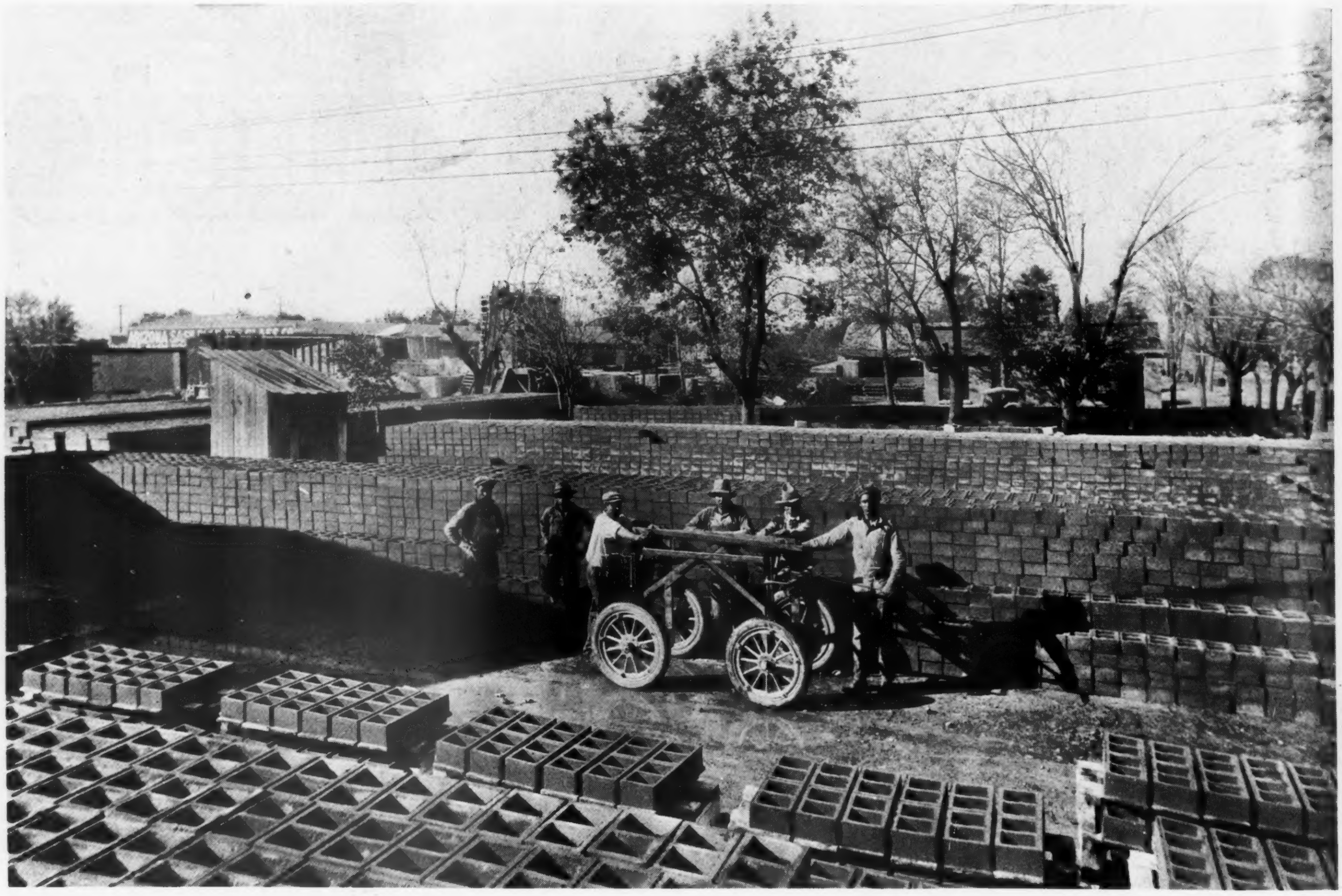
Until the present time there has been no building code as such, but a code is now being drawn up and is expected to be adopted within a few months. There is no discrimination against any building materials and there will be none in the new code, except that for any given purpose or use the material must be of a reasonable quality and stand up.

Most of the concrete tile here is made by the Cement Products, Inc. Some is also made by the Shope Brick Co. of Phoenix, but most of this company's output is a concrete face brick made in a variety of colors and selling up to $35 and $40 per M. This plant has four hand tamping machines, which make ten brick per pallet, and one power machine which makes two tile at a time. It is located at Seventh avenue and Pierce street.

Cement Products, Inc.

The plant of Cement Products, Inc., is located at 715 West Buchanan street and has been operated since 1923.

Besides making concrete building units it has a considerable business in ready-mixed lime mortar, perhaps 75% of the total.



Yard of Cement Products, Inc., showing buggy used in transferring racks of building tile

Most of the hollow tile are made in the 5x8x12-in. size, although 5x6x12 and 5x4x12 sizes are also made with a few 5x4x8 tile for corner work, etc. These have one central cross partition across the short dimension. A few 2½-in. concrete brick of the same size as the local adobe brick are also made, but these are not pushed.

Special Kinds of Tile Developed

Other special shapes have been developed and are made for use around windows and some tile with solid tops for use in the top course. A large part of the success of this company in supplying these concrete building units has no doubt been due to the extent to which it has co-operated with the user and contractor to furnish exactly what is wanted.

As a case in point, the top of each tile is formed out in such a way as to give a satisfactory handhold in picking up the tile, as it was found that the smooth tile without such a projecting edge on the cross partition was objected to by the bricklayers. The tile without this edge were found much more tiring to handle than ordinary brick because of the greater effort required in holding the heavier tile.

The tile are made in ten hand tamping machines of the company's own design and of local construction, which make two of the 5x8x12 tile or eight bricks at one time. The pallets are racked as made and transported to the yard for curing by a rubber-tired four-wheeled buggy shown in one of

School and apartment building of concrete tile covered with stucco

Cement Products, Inc., with mortar mixing plant

Yard of Shope Brick Co. of Phoenix

the accompanying illustrations. They are held in the yard for curing for 21 days.

The capacity of the plant is about 5000 tile, or about 25,000 brick, per day. A careful selection is made of the sand and a 1 to 5 mix used, which is made in small mixers near the machines.

The concrete bricks are sold at $14 per M and the 5x8x12 tile, which take the place of six bricks, at $60 per M, the other tile prices being in proportion. E. T. Hazelett is president and W. T. Bartol secretary-treasurer, and the latter is in charge of the plant.

Concrete Pipe

The principal manufacturers of concrete pipe are the Arizona Concrete Co., Inc., 1724 Grand avenue; the Phoenix Concrete Pipe and Construction Co., 330 South 19th avenue, and the Southwestern Cement Pipe Co. on South 16th avenue.

This pipe is made by both the packer-head and power tamper methods in sizes up to 24-in., and by hand tamping up to 36-in. diameter. The pipe is used principally for irrigation conduits and drainage, with some going to sewer work.

Arizona Concrete Co., Inc.

Two power tamping machines are used at the plant of the Arizona Concrete Co., Inc., for making pipe up to 24-in. size, one tamper being used on the smaller pipe and two on the larger. The machines were made by the Tuerck-Mackenzie Co., Portland, Ore.

Both sewer and irrigation types, that is, one type with a bell joint and the other with tapered-edge ends, are made. Some double reinforced-concrete pipe has also been made at this plant. The Snow Manufacturing Co.'s (Los Angeles) expandable metal forms are used.

This concrete company is also engaged in contracting, and at the present time is laying considerable cast-iron pipe for city water mains in connection with the large water program. C. M. Vanderford is president and S. B. Shumway is vice-president and treasurer.

Phoenix Concrete Pipe and Construction Company

The plant of the Phoenix Concrete Pipe and Construction Co. uses a packer-head type machine of the Martin Iron Works, Los Angeles, to make pipe from 6-in. up to 16-in. size. Larger sizes up to 36-in. diam. are made by hand. Some reinforced-concrete pipe has also been made. This is in 3-ft. lengths except some of the smallest and largest sizes, and is made principally for irrigation work.

Special attention is paid to getting an exact mix, two grades of sand, fine crushed gravel dust and some gravel up to ⅜-in. size being used. The concrete is mixed in a 10-cu. ft. Martin mixer, then discharged to a hopper, from which it is carried up by a drag chain conveyor to the machine. It is not as dry as that used in the tamper type machines.

The packer-head machine has a rotating head or short cylinder equal in diameter to the inside of the pipe which is to be formed and in appearance much like a piston. It is attached to the lower end of a vertical shaft and is rotated to form the pipe as it is slowly raised up through the form.

Expandable steel forms are used and one pipe is made at a time. Each form is placed on one end on a horizontal table and held down during the forming operation by the hopper through which the concrete is fed. This table, which is circular, has places for receiving two forms and is turned half around for each pipe, one being made while the completed pipe and form is removed and a new form set up. The form containing the completed pipe is taken to the yard by a two-wheeled buggy arranged with two projecting arms which engage pins on the sides of the form. In the yard the form is removed by expanding it and the pipe left standing on end to cure.

In making the pipe the head is run to the bottom of the form and then moved up through the concrete. Inclined blades above the head are set so as to force the concrete down against the travel of the head, thus causing it to be packed into place.

About 200-ft. per hour of 12-in. pipe can be made on one machine and other sizes in proportion. W. T. Wilkinson is manager.

Southwestern Cement Pipe Co.

A Martin packer-head type machine is used at the plant of the Southwestern Cement Pipe Co. with the same general arrangements as at the other plant.

Irrigation pipe up to 36-in. diam. has been made here. The plant was not being operated when visited. Jack Maize is manager.

Grunow Memorial Clinic, an attractive modern building of concrete tile and stucco

The Rock Products Market

Wholesale Prices of Aggregates

(F.O.B. Plant or City Designated)

Prices given are for crushed limestone per ton, unless otherwise stated

	Crushed stone: Screenings, ¼ in. down	Crushed stone: ½ in. and less to 2½ in.	Sand ¼ in. and less	Gravel, ½ in. and less to 2 in.	Slag: Screenings, ¼ in. down	Slag: Crushed, ½ in. and less to 3 in. and larger
EASTERN:						
Albany, N. Y.			.70	1.00		
Bethlehem, Penn.					.50– .60	.60–1.00
Birdsboro, Penn. (trap rock)	2.10	2.20–2.50				
Boston, Mass. (s)			1.15	1.75		
Buffalo, N. Y.			1.00–1.10	1.00–1.10	1.50d	1.50–1.60d
Clarence, N. Y.			1.00–1.10	1.00–1.10		
Devault, Penn.	.85–1.15	1.05–1.80				
Georgetown, D. C.			.85	1.30		
Hillsville, Penn.	.85	1.35				
Hartford, Conn. (trap rock)	1.00	1.00–1.25	.80	1.20–1.50		
New York City*			1.00	1.50		
Montoursville, Penn.			.75–1.00	.40– .50		
Oriskany Falls, N. Y.	.50–1.00	1.00–1.35				
Philadelphia, Penn.			1.40–1.50	1.95–2.20a		
Pittsburgh, Penn.			1.75–2.50†	1.55–2.30†		
Prospect Junction, N. Y. (o)	.50– .80a	a.85–1.25p				
Rochester, N. Y.			1.40	1.40		
CENTRAL:						
Alton, Ill.	1.75	1.75				
Bloomington, Ind.			1.20	1.35		
Cape Girardeau, Mo.	.90	1.00–1.10				
Chicago, Ill.	1.40	1.40–1.50	1.00–1.20	1.00		
Columbus, Ohio			.50– .60j	.75j		
Des Moines, Ia.			.70	1.25–1.90		
Eau Claire, Wis.				.50– .85b		
Grand Rapids, Mich.			.40– .50	.60– .70		
Greenbush, Mich.			.40	.70c		
Hannibal, Mo.	1.40	1.40				
Jackson, Ohio					.65‡	1.05–1.55‡
Indianapolis, Ind.			.36– .54d	.36– .63d		
Riverton, Ind.			.40– .75	.50– .75		
Ironton, Ohio					1.05‡	1.45–1.80‡
Kansas City, Mo.			1.20			
Milwaukee, Wis.	1.14	1.24	1.15–1.75*	1.25–1.60*		
Pekin and Peoria, Ill.			.20– .60	.30– .60		
Stone City, Ia.	.75	1.00				
St. Louis, Mo. (e)	1.20–1.40	1.20–1.40	.80	1.00–1.15		
St. Paul, Minn.		1.25	.35	1.25		
Sheboygan, Wis.	1.00	1.00				
Waukesha, Wis.	.90	.90	.45	.60		
Toledo, Ohio	1.10	1.60			1.00	1.10
SOUTHERN:						
Ashland, Ky.					1.05‡	1.45–1.65‡
Atlanta, Ga. (granite)	1.20	1.60–1.85				
Birmingham, Ala.					.55‡	.80–1.25
Cayce, S. C. (granite)		1.40–1.60g				
Columbia, S. C. (granite)	.50	1.40–1.60				
Dallas, Tex.	.50	1.00–1.30				
Dallas, Tex. (trap rock)		1.25–1.55				
Fort Spring, W. Va.	.35	1.00–1.35				
Fort Worth, Tex.			1.50j	1.65j		
Houston, Tex.			1.00	1.95		
Knoxville, Tenn.		1.30h	.80–1.20	.90–2.00		
Longdale, Va.					.75	1.05–1.25
Montgomery, Ala.			.25– .35	.50– .60		
New Braunfels, Tex.	.60	.75–1.00				
Olive Hill, Ky.	.50–1.00	.90–1.00				
Richmond, Va.			1.15–1.30	1.55–1.75		
Rocky Point, Va. (m)	.30– .60	.75–1.10				
Roseland, La.			1.20	1.55–1.80		
Tyrone, Ky.	.50– .90	.50–1.25				
Waco, Tex.			.90	1.15–1.25		
WESTERN:						
Denver, Colo.			1.15–1.25*	1.25–2.05*		
Bay points, Calif.	t1.60–1.90j	t1.25–1.50j	1.25j	1.25j		
Long Beach, Calif.			1.60–1.70s	2.20–2.30s		
Los Angeles, Calif.			1.40–1.60	1.90–2.20		
Phoenix, Ariz.			1.65–1.75*	1.50–2.00*		
Salt Lake City, Utah			.60	.60– .80		
San Francisco, Calif.			1.45–1.85	1.45		
Seattle, Wash.			1.25*	1.25*		
Spokane, Wash.			1.25–2.50r	1.25–2.50r		
Tulsa, Okla. (n)	.70	1.20–1.60				

*Prices per cu. yd. †Less 10c per ton monthly settlements disc. ‡Prices less 5c disc. per ton for payment 15th following month. (a) Consumer prices subject to cash disc. of 10c per ton. (b) ½ in. to 1½ in. (c) 2 in. and less. (d) F.o.b. trucks at plant. (e) Asphalt filler dust in bulk 4.75, in 3-ply paper bags, 5.40. (f) Price per cu. yd. f.o.b. scows. (g) ¾ in. to 2½ in. (h) F.o.b. cars Knoxville, including tariff for 15 mile R. R. haul. (j) Price f.o.b. cars. (k) Cash disc. 2%. (m) F.o.b. plant. (n) 5% cash disc. payment 10 days; 30 days net. (o) F.o.b. cars or truck at plant. (p) ⅜ in. to ¾ in., 1.10. (s) Delivered to job by truck. (t) F.o.b. barges, water front.

Agricultural Limestone

(Crushed)

Atlas, Ky.—50% thru 50 mesh, per ton, 1.00; 90% thru 4 mesh, per ton	.50
Chico, Tex.—⅛ in. down, per 100 lb., f.o.b. cars	1.00
Colton, Calif.—Analysis, 95-97% $CaCO_3$; 1.31% $MgCO_3$, all thru 14 mesh down to powder	**3.50**
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 4 mesh, 50% thru 20 mesh; bulk	1.10
Dolomite, Calif.—Analysis, 54% $CaCO_3$; 45% $MgCO_3$; 99% thru 10 mesh, per ton, 2.10; 49% thru 60 mesh, ¼-in. to dust, per ton	**1.70**
Fort Spring, W. Va. — Analysis, 90% $CaCO_3$; 3% $MgCO_3$; 50% thru 50 mesh; bulk, per ton	1.15
Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; 50% thru 50 mesh	1.25
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; in bags	5.00
Lannon, Wis. — Analysis, 54% $CaCO_3$; 44% $MgCO_3$	1.50–2.00
Osborne, Penn. — Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$; 50% thru 100 mesh	2.50–4.00
Stone City, Ia.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.10

(a) Less 50c commission.

Agricultural Limestone

(Pulverized)

Alton, Ill.—90% thru 100 mesh	4.50
Bedford, Ind.—95% thru 10 mesh, 38% thru 50 mesh, per ton, f.o.b. plant	1.30–1.50
Bellefonte, Penn.—100% thru 30 mesh, 80% thru 100 mesh, 60% thru 200 mesh, in bulk per ton, 3.00*; in 80-lb. paper bags, per ton, 3.75*; 20-mesh pulverized limestone, 100% thru 20 mesh, 65% thru 100 mesh, 45% thru 200 mesh, in bulk per ton, 2.50*; in 80-lb. paper bags	*3.25
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	**1.50**
Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; bulk, 3.00; in bags	**4.50**
Hillsville, Penn.—90% thru 100 mesh, 50% thru 100 mesh	1.00–4.50
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.25
West Rutland, Vt. — Analysis, 96.5% $CaCO_3$; 1% $MgCO_3$; 90% thru 50 mesh; bags, per ton, 3.75; bulk	2.50

*Less 25c discount 10 days.

Roofing Slag

Prices given are per ton f.o.b. city named, unless otherwise noted.

Ashland, Ky.	2.05*
Bethlehem, Penn.	1.00–1.50‡
Birmingham, Ala.	2.05*
Buffalo, N. Y.	2.50†
Ironton, Ohio	2.05*
Jackson, Ohio	2.05*
Longdale, Va.	2.50
Toledo, Ohio	1,10

*Less 5c ton disc. for pay. 15th following month. †Price f.o.b. trucks at plant, subject to discount of 10c per ton for payment on or before the 15th of following month. ‡F.o.b. plant.

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton	6.00
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Whiting

St. Louis, Mo., per ton	15.00*
Chicago, Ill., prices per ton.	
Domestic putty whiting	10.00–12.00
Domestic precipitated whiting	15.00–20.00
Imported bolted whiting	30.00–35.00

*Packed in bbl., f.o.b. St. Louis.

Lime Products

(Lowest carload prices per ton f.o.b. shipping point unless otherwise noted)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Bulk	Ground burnt lime, Bags	Lump lime In bulk	Lump lime In bbl.
EASTERN:								
Cedar Hollow, Devault, Mill Lane, Knickerbocker, Rambo and Swedeland, Penn.	....	9.00c	9.00c	9.00c	7.50	9.00	8.50	....
Lime Ridge, Penn.	....	....	8.00	....	6.00	7.00	4.50	....
CENTRAL:								
Cold Springs, Ohio	....	5.50	5.50	....	....	....	....	....
White Rock, Gibsonburg, Marblehead, Ohio, and Huntington, Ind.	7.00*	5.50†	5.50†	11.00†	6.00†	8.00†	6.00†	....
Delaware, Ohio	7.00	5.50	5.50	6.50	....	....	6.00	....
Tiffin, Ohio	....	....	....	....	6.00	8.00	....	....
SOUTHERN:								
Keystone, Ala.	15.00	8.00	....	7.50d	....	....	6.50	13.75
Knoxville, Tenn.	....	8.00	8.00	7.50	....	....	6.50	13.80
Richmond, Va.	11.40	10.16	10.16	10.16	8.66	10.16	8.66	....
WESTERN:								
Little Rock, Ark.	....	14.30	....	14.30	....	....	12.30	17.40

(a) In 100-lb. bags. (c) In 50-lb. paper. (d) To 10.00. *At White Rock and Gibsonburg, Ohio. †At Marblehead, White Rock, Gibsonburg, Ohio, and Huntington, Ind.

Portland Cement

	F.o.b. city named Per Bag	Per Bbl.	High Early Strength
Atlanta, Ga.	....	†1.87	2.92¶
Birmingham, Ala.	....	†1.56	2.61¶
Boston, Mass.	.43½	†1.74	2.48¶
Charleston, S. C.	....	1.89†	2.94¶
Chicago, Ill.	....	1.35†	2.11¶
Cincinnati, Ohio	....	1.50†	2.16¶
Cleveland, Ohio	....	1.50†	2.34¶
Columbus, Ohio	....	1.50†	2.26¶
Dallas, Tex.	....	1.76	3.08¶
Dayton, Ohio	....	1.50†	2.19¶
Detroit, Mich.	....	1.45†	2.30¶
Houston, Tex.	....	1.98	3.10¶
Jackson, Miss.	....	†1.94	2.99¶
Jacksonville, Fla.	....	†1.96	3.01¶
Indianapolis, Ind.	....	1.30†	2.04¶
Louisville, Ky.	....	1.41†	2.09¶
Memphis, Tenn.	....	†1.73	2.78¶
Milwaukee, Wis.	....	1.50†	2.20¶
New Orleans, La.	....	1.86†	2.96¶
New York, N. Y.	.37¼	1.49†	2.24¶
Portland, Ore.	....	2.50‡	......
Reno, Nev.	....	2.96‡	......
St. Louis, Mo.	....	1.44†	2.09¶
San Francisco, Calif.	....	2.24‡	......
Savannah, Ga.	....	1.89†	2.94¶
Seattle, Wash.	....	1.50–1.55	2.00c
Tampa, Fla.	....	2.00†	3.16¶
Toledo, Ohio	....	1.50†	2.28¶
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Hudson, N. Y. (d)	....	1.21–1.36†	2.29¶
Lime & Oswego, Ore.	....	2.50	......
Limedale, Ind.	....	1.10†	......

NOTE: Unless otherwise noted, prices quoted are net prices, without charge for bags. Add 40c per bbl. for bags. *Includes dealer and cash discounts. †Includes 10c cash discount. ‡Subject to 2% discount payment 10th of month following invoice date. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c discount 15 days. (c) Quick-hardening "Velo," packed in paper bags, 10c discount 10 days. (d) 1.36 trucks, mill; 1.21 cars, mill.

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Chicken Grits

Bellefonte, Penn.—(Limestone) Coarse, mixed, in 100-lb. jute bags, per ton, 8.00; in bulk, per ton	4.50
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per 100-lb. sack, f.o.b. Chico	**1.00**
Davenport, Iowa—High calcium carbonate limestone, in bags, L.C.L., per ton	**6.00**
Gibsonburg, Ohio—(Agstone)	**10.00**
Los Angeles, Calif.—(Gypsum), per ton, including sacks	**7.50– 9.50**
Marble grits, per ton, incl. sacks	**10.00–12.50**
Middlebury, Vt.—Per ton (a)	**10.00**
Port Clinton, Ohio—(Gypsum), per ton	**6.00**
Randville, Mich.—(Marble), per ton, bulk	**6.00**
Warren, N. H.	**8.50– 9.50**
Waukesha, Wis.—(Limestone), per ton	**7.00**

(a) F.o.b. Middlebury, Vt. ¶C.L. ‖L.C.L.

Florida Phosphate
(Raw Land Pebble)

Mulberry, Fla.—Gross ton, f.o.b. mines

68/66% B.P.L.	**3.15**
70% minimum B.P.L.	**3.75**
72% minimum B.P.L.	**4.25**
75/74% B.P.L.	**5.25**
77/76% B.P.L.	**6.25**

Wholesale Prices of Slate

Lowest prices f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200 mesh, 6.00 per ton in paper bags

Slate Granules

Blue-grey, per ton, in bulk 5.25–5.50*

***Plus 10c per bag additional when packed in burlap bags.**

Roofing Slate

Prices per square—Standard thickness

City or shipping point	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Bangor, Penn.—						
Gen. Bangor No. 1 clear	**10.00**	**20.00**	**25.00**	**29.00**	**40.00**	**50.00**
Gen. Bangor No. 1 ribbon	**9.00**	**16.00**	**20.00**	**25.00**	**35.00**	**46.00**
No. 1 Albion	**7.25**	**16.00**	**23.00**	**27.00**	**37.00**	**46.00**
Gen. Bangor No. 2 ribbon	**6.75**	....	....	....	....	....
Chapman Quarries, Penn.—						
No. 1 slate		**12.50**	**18.00**	**21.50**	**25.00**	**30.00**
Hard vein	**9.00–11.00**	**15.00**	**22.00**	**26.50**	**32.00**	**37.00**
No. 2 slate	**8.00– 9.00**	....	....	....	....	....
Pen Argyl, Penn.—						
Graduated slate	....	**16.00**	**23.00**	**27.00**	**37.00**	**46.00**

Albion blue-grey roofing slate, No. 1 clear 7.25; mediums 8.00; No. 1 ribbon 8.00.

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; lowest net prices per ton f.o.b. plant

City or shipping point	Molding Fine	Molding Coarse	Brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.25	......	......	3.50	......
Eau Claire, Wis.	......	......	......	......	......	2.75b	......
Elco, Ill.	Amor. silica, 90-99½% thru 325 mesh, $10.00						
Montoursville, Penn.	......	......	......	1.35a	......	......	......
Ohlton, Ohio	1.60	1.60	......	1.75	1.60	1.75	......
San Francisco, Calif.	3.50†	5.00†	3.50†	2.50†	5.00†	3.50†	......
Silica, Va.	Flint, 7.00 to 8.00 per ton						
South Vineland, N. J.	Washed silica, 1.50 per ton; dry white, 2.00 per ton						

†Fresh water washed, steam dried. *Damp. (a) To 1.60. (b) To 3.00.

Glass Sand

(Silica sand is quoted washed, dried and screened)

Ohlton, Ohio	2.40
Silica, Va.	2.50– 3.00
San Francisco, Calif.	4.00– 5.00

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Eau Claire, Wis.	4.00	.50– .75
Ohlton, Ohio	1.60	1.60
San Francisco, Calif.	3.50	3.50

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chester, Vt.—Finely ground talc (carloads), Grade A—99-99¾% thru 200 mesh, 8.00–8.50; Grade B, 97-98% thru 200 mesh	**7.00– 7.50**
1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of burlap bags. Terms 1%, 10 days.	
Emeryville, N. Y.:	
Ground talc (200 mesh), bags	**13.75**
Ground talc (325 mesh), in bags	**14.75**
Henry, Va.:	
Crude (mine run), bulk	**3.50– 4.00**
Ground talc (150-200 mesh), bulk, 5.00–8.00; in bags	6.25– 9.00
Hailesboro, N. Y.:	
Ground talc (300-350 mesh), in 200-lb. bags	15.50–20.00
Joliet, Ill.:	
Ground talc, 200 mesh, in bags:	
California talc	30.00
Southern talc	20.00
Illinois talc	10.00
Natural Bridge, N. Y.:	
Ground talc (325 mesh), bags	**10.00–15.00**

Rock Phosphate

Prices given are per ton (2240 lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.	4.25– 4.75
Mt. Pleasant, Tenn.: (Screened)	
B.P.L. 78%, furnace lump	6.25
B.P.L. 72%, run of plant lump and fines	5.00

Ground Rock
(2000 lb.)

Gordonsburg, Tenn.	5.25– 6.00
Mt. Pleasant, Tenn.—(Lime phosphate) —B.P.L. 75%; per ton, bags extra	12.80

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Martinsville, Va.	
Mine scrap, per ton	16.00
Clean shop scrap, per ton	22.00
Punch, per ton	120.00
Franklin, N. C.	
Mine scrap, per ton, f.o.b. mine	15.00
Mine run, per ton, f.o.b. mine	10.00
Clean scrap for wet grinding, per ton, f.o.b. mine	20.00
Ground mica, per ton at mill, 20 mesh, 25.00; 40 mesh, 30.00; 60 mesh, 35.00; 100 mesh	50.00
Roofing mica, per ton at mill, schist, 17.00; white	30.00
Punch, per lb.	.05

Masonry Cement

The prices shown here are for various brands of masonry and mortar cement, including cost of bags.

	Per bag	Per bbl.
Atlanta, Ga.	.42¼	1.69–2.24*
Baltimore, Md.	.40¾	1.63–2.21*
Birmingham, Ala.	.42¼	1.69–2.21*
Boston, Mass.	....	2.25*
Buffalo, N. Y.	....	2.10*
Charleston, S. C.	.42¼	1.69–2.39*
Chicago, Ill.	†.46	†1.84–2.09*
Cincinnati, Ohio	†.43½	†1.74–1.99*
Cleveland, Ohio	†.46¾	†1.87–2.12*
Columbus, Ohio	.43¼	1.73–2.07*
Dallas, Tex.	....	2.69*
Dayton, Ohio	†.44	†1.76–2.02*
Des Moines, Ia.	....	2.34*
Detroit, Mich.	†.46¾	†1.87–2.12*
Indianapolis, Ind.	†.42½	†1.70–1.95*
Jackson, Miss.	....	2.31*
Jersey City, N. J.	.42¼	1.69–2.20*
Kansas City, Mo.	....	2.39*
Louisville, Ky.	†.40½	†1.62–1.97*
Memphis, Tenn.	†.48½	†1.94–2.20*
Milwaukee, Wis.	....	2.12*
New Orleans, La.	....	2.43*
New York, N. Y.	.42¼	1.69–2.20*
Norfolk, Va.	.41¾	1.67–2.31*
Philadelphia, Penn.	.41¼	1.65–2.21*
Pittsburgh, Penn.	.42¼	1.69–2.10*
Richmond, Va.	.41¼	1.65–2.37*
St. Louis, Mo.	†.45¾	†1.83–2.10*
Toledo, Ohio	†.46	†1.84–2.09*
Tulsa, Okla.	....	2.61*
Wheeling, W. Va.	.42¼	1.69–2.09*
Winston-Salem, N. C.	....	2.31*

*Price for delivery in car lots to contractors at point given, including value of cloth sacks, for which refund is made of 10c each when returned in good order. Shipped in paper bags 25c a bbl. less. Price subject to cash discount of 10c bbl. for payment 15 days from date of invoice.

†Packed in paper sacks; price includes cost of sacks.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Cardiffe, Md.—Crushed green marble	12.50– 14.50	12.50– 14.50
Crown Point, N. Y.—Mica Spar	....	¶9.00a–‖12.00
Davenport, Ia. — White limestone, in bags, ton	‖6.00	‖6.00
Los Angeles, Calif.—(a)		
White	¶11.00–‖13.50	¶11.00–‖13.50
Snowflake	....	¶11.00–‖13.50
Golden, browns, grey, blues, blacks	¶16.00–‖18.50	¶16.00 ‖18.50
Dolomite, Calif. (Lone Pine)—(a)		
White	¶8.80– ‖8.80	¶8.80– ‖8.80
Snowflake	....	¶8.80– ‖8.80
Golden, browns, grey, blues, blacks	¶13.80–‖13.80	¶13.80–‖13.80
Middlebrook, Mo.—Red	....	20.00– 25.00
Middlebury, Vt.—White	....	¶9.00–‖10.00
Randville, Mich.—Crystalite, crushed white marble, bulk	4.50	4.50– 5.00
Tuckahoe, N. Y.	6.00	....
Warren, N. H.	....	¶7.00– 11.25

¶C.L. ‖L.C.L. *Per 100-lb. (a) Including bags.

Art and Cast Stone Aggregates

Cardiffe, Md.—Crushed green marble in carloads; bulk, 7.50; in bags	10.00
Los Angeles, Calif.—Dolomite aggregates, all sizes and colors†	¶10.00 ‖12.50
Dolomite special cast stone, wet cast aggregate, white, ¼-in. to dust	a5.30

† 100-lb. sacks. ¶C.L. ‖L.C.L. (a) In open cars.

Potash Feldspar

East Liverpool, Ohio — Color, white; analysis, K_2O, 11%; Na_2O, 2.25%; SiO_2, 67.25%; Fe_2O_3, 0.05%; Al_2O_3, 18.25%, pulverized, 99% thru 200 mesh; in bags, 20.70; in bulk	19.50
Erwin, Tenn. — White; analysis, K_2O, 10.50%; Na_2O, 2.50%; SiO_2, 67.50%; Fe_2O_3, 0.06%; Al_2O_3, 18%; pulverized, 98% thru 200 mesh; in bags, 16.50; bulk	15.00
Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.30%; Na_2O, 2%; SiO_2, 67%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk	15.00
West Paris, Me.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.20%; Na_2O, 3.20%; SiO_2, 65.70%; Fe_2O_3, 0.09%; Al_2O_3, 19.20%; per ton, in bulk	19.00

Soda Feldspar

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 5.50%; Na_2O, 5.50%; SiO_2, 68.80%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk	18.00

Cement Building Tile

Lexington, Ky.:	
5x8x12, per 1000	55.00
4x5x12, per 1000	35.00
Longview, Wash. (Stone Tile):	
4x6x12, per 1000	60.00
4x8x12, per 1000	70.00

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Cicero, Ill.—French and Spanish tile, 9x15-in., per sq.	9.50–12.00
Closed end shingle, 8½x12½ in., per sq.	11.00–13.00

Cement Drain Tile

Longview, Wash.—Drain tile, per foot

3-in.	.06	8-in.	.18
4-in.	.08	10-in.	.25
6-in.	.12	12-in.	.35

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

Brookville, Penn.: 8x8x16	20.00§–23.00a
8x10x16	25.00§–28.00a
Camden, N. J.: 8x8x16, each	.18b
Columbus, Ohio: 8x8x16	§10.00–a11.00*
Lexington, Ky.:	
8x8x16	‡18.00*
8x8x16	†16.00*

*Price per 100 at plant.
†Rock or panel face.
‡Face. §Plain. (a) Rock face. (b) Less 10%.

Stone-Tile Hollow Brick

Prices are net per thousand, f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	29.00	42.50	53.00
Brownsville, Tex.	......	53.00	62.50
Brunswick, Me.	29.50	42.25	55.00
Daytona Beach, Fla.	45.00	55.00	65.00
Houston, Tex.	35.00	45.00	60.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.	......	50.00	60.00
Los Angeles, Calif.	29.00	39.00	45.00
Macon, Ga.	25.00	35.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	45.00	50.00	60.00
Mineola, N. Y.	40.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans La.	35.00	45.00	60.00
Norfolk Va.	35.00	50.00	65.00
Passaic, N. J.	40.00	52.50	70.00
Pawtucket, R. I.	27.50	41.25	55.00
Roanoke, Va.	32.50	40.00	50.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% discount.

Concrete Brick

Prices given per 1000 brick, f.o.b. plant.

	Common	Face
Birmingham, Ala.	13.00	....
Longview, Wash.	16.50	22.50– 45.00
Milwaukee, Wis.	14.00	15.00– 42.00
Prairie du Chien, Wis.	12.00	20.00– 22.50

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points. Bags extra and returnable for full credit.

16– 30 mesh	20.00
30– 60 mesh	22.00
60–100 mesh	18.00
100 mesh and finer	9.00
Joliet, Ill.—All passing 100 mesh, f.o.b. Joliet, incl. cost of bags	24.00

Louisiana to Have New Gravel Plant

BATEMAN CONTRACTING CO., which has recently moved its headquarters to Alexandria, La., has purchased from A. H. Herndon a gravel pit located about four miles from Pineville. The Bateman Contracting Co. is arranging to make a complete installation of the most modern sand and gravel washing and screening machinery, capable of giving a production of 100 tons per day. Already a 100-hp. Deisel engine has been purchased for running the 8-in. centrifugal gravel pump, and a dragline will be installed within a few days. Other new machinery will be installed immediately.

Mr. Bateman recently purchased a tugboat and some barges to haul sand and gravel to the Red river barge, which they are building at Moncla, on the new Marksville-Archie highway. Piles have been driven above the L. & A. bridge on the Pineville side of the river, on which sand and gravel bins are being constructed for loading barges. Material will be loaded on barges out of these bins for other points on Red river as well.

Negotiations are now under way for running railroad trackage from Pineville.

There are about 70 acres of excellent gravel in the pits, of the best quality, which passes all tests for state and federal aid highway concrete of all classes.

Production will be carried on under the trade name of Bateman Sand and Gravel Co.—*Alexandria* (La.) *Weekly Town Talk.*

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4-in.	6-in.	8-in.	10-in.	12-in.	15-in.	18-in.	20-in.	22-in.	24-in.	27-in.	30-in.	36-in.	42-in.	48-in.	54-in.	60-in.
Longview, Wash.	.17½	.24½	.30	.42	.60	.90	1.26	......	......	2.16	......	3.60	4.50	5.50	6.50	7.50	......
Mercedes, Texas																	
Tongue and groove	.16	.20	.23	.29	.35	......	.74	.91	......	1.38	......	2.28	......	......	......	......	......
Sewer	.16	.22	.32	.41	.53	.78	1.05	......	......	1.98	......	......	......	......	......	......	......
Tiskilwa. Ill. (a)	......	......	......	.75	.85	95	1.20	1.60	......	2.00	......	2.75	3.40	......	6.50	......	10.00
Wahoo, Neb. (b)	......	......	......	......	.85½	......	1.14	......	......	1.81	......	2.47	3.42	4.13	5.63	6.49	7.31

(a) Reinforced. (b) Reinforced, 15.40 per ton, f.o.b. plant.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

City or shipping point	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	Plaster Board ¼x32x36". Per M Sq. Ft.	Plaster Board ⅜x32x36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Los Angeles, Calif. (a)	....	....	7.50	....	12.20b	....	13.20b	....	....	13.20b	....	....	....
Medicine Lodge, Kan.	1.45	....	....	....	....	....	11.50b	....	16.00b	....	....	....	....
Oakfield, N. Y.	2.50	....	....	5.00	9.00b	9.00b	....	6.00b	....	....	....	....	....
Port Clinton, Ohio	4.00	6.00–8.00	6.00–8.00	10.00m	10.00n	10.00n	20.00k	8.00–11.00	24.50f	26.00g	15.00h	15.00h	27.00j
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	....	....	....	....	20.00	25.00c	33.00d

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) Plaster board, ⅜x16x48-in., weight 1850 lb., 16c a yd. (b) Includes paper bags. (c) Includes jute sacks. (d) "Gyproc," ⅜x48-in. by 5 and 10 ft. long. (f) To 27.50. (g) To 29.00. (h) To 16.00. (j) To 28.00. (k) To 23.00. (m) To 12.00. (n) To 13.00.

Gypsum in 1930

PRODUCTION of the gypsum industry in 1930 fell below the level for the preceding year, according to a statement made public by the United States Bureau of Mines, Department of Commerce, based on reports received from 56 operators in 16 states and collected in co-operation with the Geological Surveys of Iowa, Kansas, Michigan, New York, Oklahoma, South Dakota, Texas and Virginia.

The quantity of gypsum mined in the United States in 1930 was 3,471,393 short tons, a decrease of 1,544,739 tons, or 31%, compared with 1929. This production, however, was greater than that of any year prior to 1922 and was more than 10% larger than that of 1920.

The total value of the calcined and uncalcined gypsum sold by producers was $27,051,484, a decrease of $4,241,485, or 14%, compared with 1929. The quantity of gypsum sold by producers without calcining in 1930 was 989,591 short tons, a decrease of 76,106 tons, or 7%, compared with 1929, and was valued at $1,886,254, or $1.91 per ton, a decrease of $210,525, or 10%, in value and of 6c per ton; the quantity of calcined gypsum sold by producers was 2,191,376 tons, a decrease of 1,170,204 tons, or 35%, and was valued at $25,165,230. This was a decrease of 14% in total value compared with 1929.

New York continues to be the largest producer of gypsum. The production of crude gypsum in that state in 1930 was 912,070 tons, a decrease of 29% from that of 1929. This was 26% of the entire quantity mined in the United States. New York is also the largest seller of gypsum, marketing 275,294 tons without calcining, or 28% of the United States total, and 573,602 tons calcined, or 26% of the total. These figures represent a decrease of 8% in the uncalcined and 33% in the calcined gypsum compared with 1929. Other important states in the production of crude gypsum in 1930 were: Michigan, 519,225 tons; Iowa, 481,047 tons; Texas, 359,315 tons, and Ohio, 255,337 tons. These five states reported 73% of the total production of crude gypsum in 1930.

The importation of gypsum constitutes quite an important factor in the industry. In 1930 eight importers with 13 plants in 10 states, namely, California, Connecticut, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Vermont, Virginia and Washington, reported to the Bureau of Mines that they imported 794,970 short tons of crude gypsum, a decrease of 22% compared with 1929. These importers reported 93,515 tons of gypsum sold uncalcined, valued at $391,150, an increase of 12% in quantity and 18% in value compared with 1929. The imported gypsum sold calcined in 1930 amounted to 648,162 tons, valued at $8,211,837, a decrease of 21% in quantity but an increase of 5% in value compared with 1929.

GYPSUM MINED AND UNCALCINED AND CALCINED GYPSUM SOLD IN THE UNITED STATES IN 1930, BY STATES

State	Number of active operators	Total quantity mined (short tons)	Sold by producers — Without calcining — Short tons	Value	Calcined — Short tons	Value	Total value
Iowa	7	481,047	155,762	$215,702	303,230	$3,525,617	$3,741,319
Michigan	5	519,225	182,050	292,881	300,524	3,462,750	3,755,631
Nevada	5	165,279	49,801	137,214	97,530	839,436	976,650
New York	10	912,070	275,294	597,938	573,602	6,461,170	7,059,108
Ohio	3	255,337	11,460	30,017	243,566	3,064,478	3,094,495
Texas	5	359,315	54,146	84,883	255,727	3,436,860	3,521,743
Utah	3	26,694	(*)	(*)	(*)	(*)	185,148
Other states †	18	752,426	‡261,078	‡527,619	‡417,197	‡4,374,919	4,717,390
	56	3.471,393	989,591	$1,886,254	2,191,376	$25,165,230	$27,051,484

*Included in "Other States."

†Includes Arizona, California, Colorado, Kansas, Montana, Oklahoma, South Dakota, Virginia, and Wyoming.

‡These figures include also sales from Utah.

Lawrence H. Whiting to Devote Full Time to Indiana Limestone Co.

LAWRENCE H. WHITING announced, May 26, his retirement as president of the Boulevard Bridge Bank of Chicago, Ill. He will devote all of his time in the future to the Indiana Limestone Co., Bedford, Ind., of which he is chairman of the board.

Mr. Whiting explained his action by saying that his duties with the Indiana Limestone Co. required more of his time than he was able to give while serving as president of the bank.

Genesee Stone Products Corp. Expands

THE Genesee Stone Products Corp., Stafford, N. Y., has purchased a controlling interest in the Batavia Washed Sand and Gravel Co., Batavia, N. Y. The company has been reorganized with A. B. Caldwell, Clarence L. Buchholtz and John H. Wade of Batavia and B. M. Boice of Churchville, directors. Mr. Caldwell is president and Mr. Buchholtz, secretary and treasurer.

The business office of the sand and gravel company will be located at Stafford with the stone products company of which Mr. Caldwell is the president.—*Batavia* (N. Y.) *News.*

New Rock Quarry in Missouri to Operate Soon

A NEW QUARRY for crushed rock to meet the local demand in the concrete construction field which is now filled largely by out-of-town quarries is being opened at the north limits of St. Joseph, Mo., and will be in operation within a month.

The supply is sufficient for 25 years of ordinary demand, it is said, and the product is a limestone rock that has passed tests showing it equal to any of the imported rock.

The St. Joseph Quarries Co., which has been out of business for several years since the Schuster quarry that it operated north of Savannah gave out, is opening the new quarry with the co-operation of the Great Western railroad.

The railroad has just completed construction of a 1000-ft. spur track to the site where the rock crushers are to be located. Machinery used at the Savannah quarry and which cost $50,000 is being moved to the new project and an additional expenditure of $20,000 is being invested.

E. H. Lawhon, president of the quarries company, said recently that the plant will have a capacity of 12 carloads of 50 tons each in a 10-hour shift. Stockholders in the company, in addition to Mr. Lawhon, are George Groves, O. W. Watkins, Marion Land, A. L. Lehr, Charles A. Geiger, Henry Hesse, John Hesse and Henry Rix.

The major portion of crushed rock now used in street and highway building and other construction work in and near St. Joseph comes from Kansas City. At the height of the construction season the local demand reaches 50 cars a day. The Heumader quarry on the waterworks road north of St. Joseph heretofore has been the only local source of rock.

Due to the cost of transporting rock, the two St. Joseph quarries will be able to undersell all outside competition to the extent of their capacity.

The deposit that is now being opened is the same one that was operated at another point from 1905 until 1912 by P. P. Young and his two brothers.—*St. Joseph* (Mo.) *News-Press.*

Beg Your Pardon!

THE EDITOR APOLOGIZES to R. L. Slocum, superintendent of the Universal Atlas Cement Co. plant at Universal, Penn., luncheon chairman of the Pittsburgh cement mill safety meeting, April 17, the doings of which were recorded in ROCK PRODUCTS, May 23, pp. 89-91. Mr. Slocum's portrait was published on p. 91 over the caption R. L. Blum. As usual in such cases the printer's devil is to blame; this particular printer's devil had a father named Pat Kelly and a mother named Rebecca Cohen, which probably explains many things.

News of All the Industry

Incorporations

Washington County Gravel Co., Greenville, Miss.

Linden Cement Co., Hempstead, N. Y., $5000. S. Golding, Hempstead.

Paducah Sand Co., Paducah, Ky., $15,000. Steve Click, M. P. Wallace and W. F. McMurry, Jr.

Arkansas Sand and Gravel Co., Fort Smith, Ark., $25,000. President, F. R. Euper, Fort Smith.

Empire Fluorspar Co., Marion, Ky. M. N. Bostin and C. B. Rina.

Gray Knox Marble Co. of Delaware, capitalized in Oklahoma at $10,000.

Alexandria Culvert Co., Alexandria, La., $50,000. U. B. Evans, J. C. Raxsdale and J. N. Weil.

Empire State Concrete Pipe Corp., 154 Nassau St., New York City, $150,000. D. E. Nueberger. To produce cement products.

Liberty Gravel Co., Gloster, Miss. A. S. Madding, Pine Bluff, Ark.; C. E. Fish, Star City, Ark., and S. A. Gano, Jackson, Miss.

Arlington Concrete Products Co., Inc., Arlington Heights, Ill., $10,000 preferred stock and $40,000 common stock. Paul C. and Allan B. Taege, Frank C. Busse and E. N. Berbexker.

Schmidt Concrete Products Co., St. Joseph, Mo., $10,000. Oscar H. Schmidt, Isabel I. Schmidt, Verna B. Hanks, Henry Hesse, John Hesse and Henry G. Rix.

Colorado Quarries, Inc., 904 Equitable Bldg., Denver, Colo., $45,000 and 2000 shares of no par value. F. H. Knollman, J. McMillan and D. K. McMillan.

Western Wisconsin Gravel Co., La Crosse, Wis., $60,000. A. J. Rasmussen and Otto Bosshard of La Crosse; E. G. Bigham of Arcadia, Wis., and Lawrence Kenneda of Holmen, Wis.

Crane Builders and Supply Co., 565 W. Washington St., Chicago, Ill., 50 shares common. To produce and sell brick, cement, etc. Irene Wuerttemberg, Millard R. Elmes and Ignatz Spitz.

Warner Acoustical, Inc., 74th St. and Ashland Ave., Chicago, Ill., $50,000. Edward Warner, Wm. McCorkle and Frank H. Marshall. To manufacture and deal in plaster.

Standard White Lime Co., Ltd., Guelph, Ont., Can., $5000, comprising 50 shares of $100 par value. To quarry, mine, produce and sell marl, stone, cement, lime, brick, tile and builders' supplies.

Summitville Gravel Co., Inc., Summitville, Ohio, 100 shares of $100 par value. Linfield Myers of Anderson, Ohio; Robert J. Spencer and David Blumenthal of Marion, Ohio, and Samuel Warner of Summitville.

Quarries

Mammen-Coy rock crusher, Golden City, Mo., has been closed down. The crusher will not be moved, Mr. Mammen says.

Ottumwa, Ia. Production of rock for use on city streets from the Des Moines river bed has started.

National Lime and Stone Co., Findlay, Ohio, reports the theft of 2500 ft. of copper wire from its quarry.

A. R. A. Laudon, Redwood Falls, Minn., and **Hugo** and **George Wederath**, Morton, Minn., have started quarrying black granite at New Ulm, Minn.

George Hyde and **R. J. Catlett**, Topeka, Kan., have signed a new contract with the Missouri Pacific railroad and have reopened the quarry and crusher at Alta Vista, Kan.

A. C. Hall, Marietta, W. Va., has leased and will open a stone quarry near St. Marys, W. Va. It is said the sandstone found there is of fine grain and excellent quality.

Winterset Limestone Quarry, Winterset, Ia., turned out the first rock from its new crusher early in May. The crusher has a capacity of 500 tons per day.

St. Joseph Quarries Co., St. Joseph, Mo., plans development, including installation of crushing equipment, on its properties near there. E. H. Lawson is president.

Rainbow Granite Co., Sacred Heart, Minn., is third granite quarry to start operations in the Mellen, Wis., district. An option on a deposit has been taken and testing of quality is in progress.

Sand and Gravel

Austin Bridge Co. gravel plant on the Moreland farm near Ballinger, Tex., is now in full operation.

Peck-Thompson Sand and Material Co., Kansas City, Mo., recently suffered considerable loss at its plant in Kansas City.

Sandusky, Ohio. A gravel pit opened by the county is believed to be one of the largest in this district.

Edward Badtke, Ripon, Wis., recently opened a gravel pit on his farm for use as concrete aggregate. The pit is 30 ft. deep and about 3 acres in extent.

Ellsworth, Wis. The county will soon complete installation of a portable rock and gravel crusher in the Trok gravel pit. It will have a capacity of 300 to 400 cu. yd. per day.

Coshocton, Ohio. A delegation of Dresden, Ohio, citizens recently met the Ohio governor to submit a request that Dresden gravel be used on the Trinway-Hanover section of state route 16.

Tom Johnson Gravel Co., Grand Haven, Mich., has purchased 132 ft. water frontage at Ferrysburg, Mich., on the Grand river, and is building a gravel dock there. The company proposes to charter the gravel carrier Fred W. Green for lake shipments.

Everett, Wash. Plans for marketing gravel from deposits on Hat Island in Port Gardner Bay are progressing. Owners of pits have completed investigation of quantity of material and are said to be considering power needed in development work.

Soo Sand and Gravel Co., Sault Ste. Marie, Mich., riparian rights will be investigated by judge and jury in its suit against M. Sullivan Dredging Co. It is contended the Sullivan company removed 100 ft. of gravel company property in fulfilling the Sullivan northwest pier contract.

Western Indiana Gravel Co., Lafayette, Ind., is said to be the only contestant to the move by Indiana railroad to abandon the Tipton-Alexandria traction line. If the line is abandoned it is said the company will have to secure right-of-way to the Nickel Plate railroad, one mile away.

Michigan Sand and Gravel Co., Saginaw, Mich., has acquired waterfront property at Bay City and is considering construction of new dock, with storage and distributing bins, including mechanical loading apparatus, conveyors and other handling equipment. Company is affiliated with Construction Materials Co., Chicago, Ill.

Cement

Concrete Supply Co., Winston-Salem, N. C., reports 40% of the concrete it is mixing is of "Incor" high-early-strength cement.

Ideal Cement Co., Denver, Colo., recently brought in a gas well near its cement mill at Ada, Okla. It is said the well is good for 30,000,000 cu. ft. of gas daily.

Great Lakes Portland Cement Corp., Buffalo, N. Y., held special exercises at its plant recently when the Portland Cement Association No-Accident trophy was unveiled.

San Antonio Portland Cement Co., San Antonio, Tex., was recently cited by the local paper as one of the outstanding industries in San Antonio. A picture of the plant was shown.

Manitowoc Portland Cement Co., Manitowoc, Wis., has asked the city to dredge shoal spots in the river channel to permit movement of heavily loaded stone-carrying vessels to its plant. The city in turn is renewing its appeal to the government for aid in maintaining the river channel.

Gypsum

Canadian Gypsum Co., Ltd., Toronto, Canada, has awarded contract for a new plant at Willow Grove, Ont., including mill building, wallboard plant, crushing buildings, warehouse, etc.

National Gypsum Co., Buffalo, N. Y., has ordered a standard 8-ton trolley type electric locomotive from the Westinghouse Electric and Manufacturing Co. This order follows the contract for electric line and sub-station equipment recently closed with Westinghouse and is the first locomotive purchased in the electrification program of the Gypsum company.

Cement Products

National Concrete Burial Vault Association held its convention at Columbus, Ohio, May 21 and 22.

Andrew Grant, Superior, Wis., has started the manufacture of colored pottery by what is known as the colorcrete process.

Watauga Cement Products Corp., Bristol, Va., is changing its name to Watauga Supply Co. E. J. Burdette is president.

Arnold Stone Co., Greensboro and Jacksonville, Fla., has received word the recent ruling by the Federal Trade Commission, requiring the company to discontinue advertising its products by such phrases as "cast stone" and similar trade names, has been reversed by the Federal Court of Appeals.

Interlocking Concrete Pipe Co., Ltd., Toronto, Canada, will soon be producing pipe in its new plant. W. H. Mackie and H. G. Carter are associated in this enterprise. They will manufacture all classes and types of concrete sewer pipe and drain tile.

Miscellaneous Rock Products

Consolidated Feldspar Corp., Los Angeles, Calif., plans to rebuild a portion of its local mill recently destroyed by fire.

Northwest Magnesite Co., Pittsburgh, Penn., with a mine at Chewelah, Wash., was the only producer to turn out magnesite from the state of Washington in 1930.

Northwestern Improvement Co., Minneapolis, Minn., has been given two additional permits to prospect for phosphate in the Elliston, Mont., district by the state land department.

Agricultural Potassium Phosphate Co., Paris, Ida., shipped a carload of phosphate to Milwaukee, Wis., recently. It is said this car is the first of what may be a large order.

Deer Lodge, Mont. Application has been made by the Northern Pacific railroad for the construction of a spur to the Wm. Anderson phosphate mine near Garrison.

Bakersfield Sandstone Brick Co., Bakersfield, Calif., suffered a $10,000 loss by fire at its plant recently. Brick making machinery was badly damaged.

Colorado Travertine Co., Wellsville, Colo., is considering the development of its properties. Rumors are that a large finishing plant will be built soon. There is a reserve of 50,000,000 cu. ft. of stone in this quarry.

Personals

J. D. Green has been appointed assistant chief engineer of the Oakfield, N. Y., plant of the United States Gypsum Co.

Douglas Smith, of the Fischer Lime and Cement Co., Memphis, Tenn., is a candidate for election as vice-president of the Civitan Club.

C. L. Wagner, general manager of Superior Portland Cement Co., Concrete, Wash., recently returned from California, where he has spent six weeks on business.

W. W. Coleman, president of the Bucyrus-Erie Co., South Milwaukee, Wis., is sailing for New York June 6. He has spent the past few months in Europe on a combined business and pleasure trip.

Frank M. Traynor, general manager of Florida Portland Cement Co., recently addressed the Rotary Club of Tampa on the possibilities of trade with countries of the Canal Zone area, from which he recently returned.

Hanford MacNider, chairman of the board, Northwestern States Portland Cement Co. and United States minister to Canada, was the principal speaker at the fourth annual Manufacturers' Chamber of Commerce dinner at Toledo, Ohio, recently.

Russell E. Lind and his part in the development of the Lind Gravel Co., Bellingham, Wash., were recently featured in the Bellingham Morning Herald. The article traced the development from the time his father, Charles E. Lind, starting as a contractor, organized the material company, and the constant development since.

J. C. McQuiston, general advertising manager of the Westinghouse Electric and Manufacturing Co.,

Recognized the World Over as the Leader in Its Field

Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

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With which is Incorporated CEMENT and ENGINEERING NEWS
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Volume XXXIV Chicago, June 20, 1931 Number 13

Rocky Mountain Stone Operation

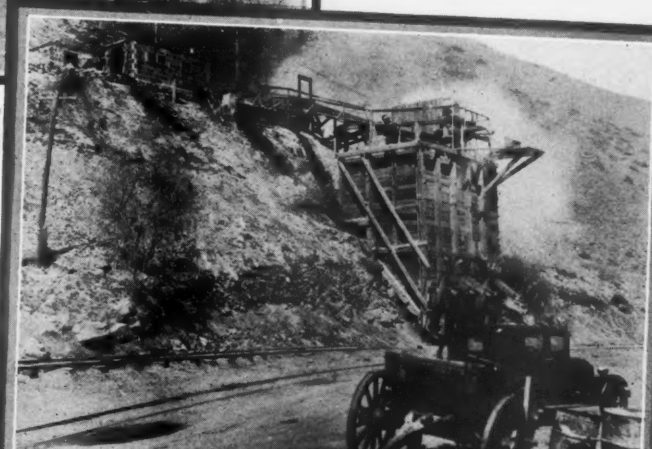
J. B. Bertrand, Inc., Near Golden, Colorado, Has an Unusual and Interesting Mountainside Plant and Quarry

By Jos. C. Coyle
Englewood, Colo.

THE FIRST TUNNEL SHOT, recently fired in the production of crushed stone, at the quarry of J. B. Bertrand, Inc., near Golden, Colo., was very effective, according to the owner; 9500 lb. of explosive broke down approximately 47,250 tons of granite, or approximately five tons of rock per pound of powder. It marks a new departure at this quarry. The quarry and crushing and screening plant have been in operation five years, but only recently was a sufficient opening attained to permit blasting on a large scale.

Taking advantage of a considerable seam of talc, entering the face of the quarry at the middle, a 4 by 5 ft. tunnel was driven into the face for 75 ft. At 45 ft. back a cross-cut was driven 50 ft. each way. These were 2½ by 3 ft., with three 4 by 5 ft. pockets in each, spaced approximately 20 ft. apart. Drilling was done with Ingersoll-Rand and Gardner-Denver jackhammers on account of the close quarters in the tunnel. Air is furnished by a Gardner-Denver compressor, driven by a 40-hp. Westinghouse motor.

The first pocket, at the left, was loaded with 1500 lb. of "Hercomite" powder, in 12½-lb. bags, supplemented by 500 lb. of Hercules 75% gelatin 1⅛ by 8-in. sticks. No. 2 pocket was charged with 1550 lb. Hercomite; No. 3 with the same. No. 4 and 5 each held 1500 lb. of Hercomite and No. 6 had 1400 lb. of the same explosive. An abundance



Above—Quarry and plant as seen from across the canyon. Left—Dumping to primary crusher. Right—Close view of plant and loading track

Drilling at top of quarry face. Superintendent Milton Ray at right

Turning cross cut of powder tunnel using jackhammer drill

of sand was available from the waste fines accumulated below the screening plant, and the cross-cuts were filled with this, packed in burlap bags. The main tunnel was filled with the tamping for 8 ft. in front of the cross-cuts. The shot was fired by James Dalrymple, Jr., from a point 400 ft. back of the quarry face, using electric blasting caps and a du Pont 50-hole blasting machine.

Blast Fired on Short Notice

The face of the quarry was 100 ft. wide and approximately 185 ft. high, and a considerable overbreak was effected by the shot, due to a vertical slip about 20 ft. back of the left-hand cross-cut and reaching to the surface, at right angles to the face. A rush order from a railroad company for rip-rap stone, to be used in a washout, occasioned the firing of the blast on short notice. Improvised wooden chutes were constructed at each side of the screening plant and loading of rip-rap was carried on along with the regular operation of the plant. Skips dumped rock above the chutes and it was relayed to them by hand.

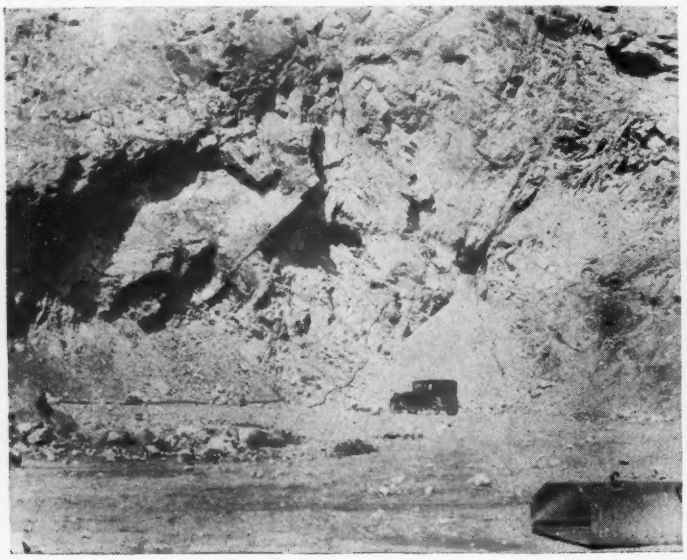
Mountain of Granite

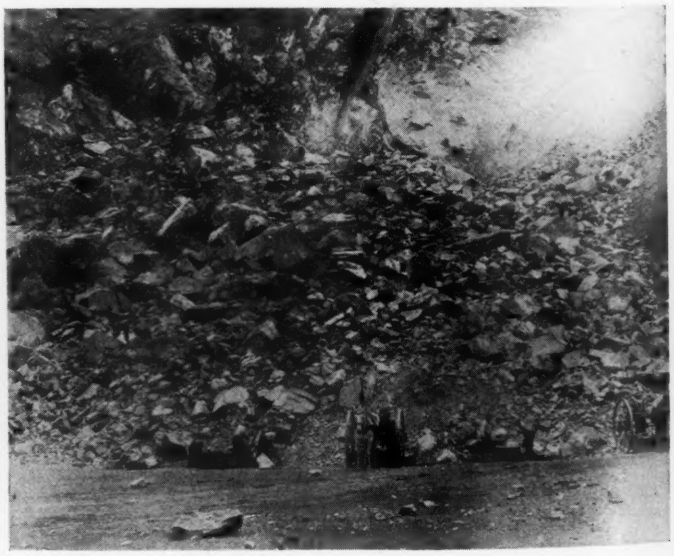
The output of the plant in the past has been 400 tons per day. From 30 to 70 men are employed, the plant sometimes operating night and day. With the opening of a sufficient face for blasting on a large scale production will be greatly facilitated. A mountain of granite is available, and the product is loaded by gravity directly into railroad cars or trucks, as the case may be. Five grades of aggregate are produced, though No. 2 rock is the principal product. Part of the output is used by the company itself, on paving contracts, etc., while the remainder is shipped and sold to railroads, municipalities and other contractors throughout a wide area.

The crushing and screening plant is situated on concreted terraces just below and to one side of the quarry, which is 100 ft. above the railroad tracks and 150 ft. above the creek bottom. This elevation allows gravity handling to the fullest extent possible. The buildings include a 10 by 20 ft. blacksmith shop; 10 by 12 ft. power house; 10 by 10 ft. harness room and 8 by 8 ft. tool room, all covered with slabs of concrete, to prevent damage from blasted rocks. A concreted reservoir, in an old quarry nearby, and fed by a mountain spring, gives an abundant supply of pure water for stock and drinking.

Transporting and Crushing

Large boulders from the big blast are broken up with "squib" shots. The rock is loaded by hand into large steel skips, which are carried to the primary crushers by horse carts. These are made by the Killefer Co.,





Quarry face as it appeared before and after the blast was made

Transformer house, derrick over hoppers to crushers, and blacksmith shop

Compressor house and shed at plant of J. B. Bertrand, Inc., Golden, Colo.

and are equipped with Simplex 15-ton jacks for lifting the loaded skips to place, and a hand crab on the front for dumping the skips. Several extra skips are used, and while loaded ones are in transit others are being loaded. The two Farrel primary jaw crushers are driven by a 75-hp. Westinghouse motor. Near them are located the two compensators, 7 starting switches and 2 safety switches (G. E. and Trumbull).

Carried by Belt Conveyors

The crushers discharge upon an 18-in. Intermountain belt, 14 ft. centers, and driven by a 2-hp. G. E. motor. This carries the rock to an 18-in. belt, 50 ft. centers, and equipped with Weller carriers and driven by a 7½-hp. G. E. motor, feeding the sizing screen, which was built by the Colorado Iron Works. All belt conveyors at the plant were made there, using Intermountain belting. Chutes from the different sections of the screen (also driven by 7½-hp. G. E. motor) carry the aggregates to three 100-ton loading bins, by gravity.

Oversize goes over the screen to an 18-in. belt, 50 ft. centers, driven by 7½-hp. G. E. motor, which carries it back and up to the Telsmith reduction crusher, driven by 25-hp. G. E. motor. From this crusher it returns again to the belt feeding the screen. Fines are stored below the plant, where a part is converted into stucco sand and chicken grits, by screening with a Leahy "No-blind" vibrating screen, 6 by 3½ ft., driven by a 1-hp. General Electric motor. Besides these fines there is open storage for 100 cars of aggregates.

Former Quarry Practice

In blasting at the quarry heretofore, drilling has been done largely with the Denver No. 7 drill and a Dempster well drill, driven by a gasoline engine. The well drill was hauled up the steep mountain slope by block and tackle, attached to a "dead man."

Drill steel up to 18 ft. in length is used with the rock drills, and is sharpened with a Sinclair sharpening machine, in the blacksmith shop. At the hopper to the primary crushers a derrick, with 16-ft. arm, is situated, equipped with Chisholm-Moore blocks for handling heavy machinery, etc.

Business Situation Summarized by Survey*

APRIL was the third consecutive month in which the volume of business in the United States, after allowing for normal seasonal trends, showed further slight expansion from the low levels established in January, while the seasonal decline occurring in early May appears to have been slightly larger than usual.

Industrial production, as measured by the Federal Reserve Board's seasonally adjusted index, registered another increase in April, and in that month was 9% above the December level. Output of manufactures was larger than in March, owing to gains in the adjusted indexes of output in the food products, automobile, leather and shoe, cement, and tobacco industries, while iron and steel and non-ferrous metal production was smaller than in the preceding month.

Commodity prices in April were practically unchanged from March except for sharp drops in building materials (especially cement), coal and petroleum, products, mixed fertilizers, rubber and textiles.

Construction activity, as measured by contracts awarded, showed relatively little change from March to April. The number of square feet of all types of construction, after having increased 34% from February to March, showed much less than the usual seasonal increase from March to April, while the value of all contracts awarded during April was 9% less than in March. A further decline of seasonal proportion's occurred in the first three weeks of May. Residential building, which has been of comparatively small volume throughout 1929 and 1930, showed but slight change from March to April; the square footage of contracts awarded for this type of building increased 2% and the value decreased 5%. Construction of public works and utilities was unusually heavy throughout 1930, but has slackened somewhat during the first four months of 1931. The value of contracts awarded for construction of this character declined about 13% from March to April, and although the total value for the first four months of 1931 is 10% larger than in the first four months of 1929, it is about 17% less than in the corresponding period of 1930.

Production of cement was at a low rate during the first quarter of 1931, but increased 36% from March to April and in the latter month amounted to about 82% of the production during April, 1929.

Construction costs as indicated by the prices of structural steel shapes, cement, lumber, and the rates paid common labor have declined almost steadily since December, 1929. The decline from March to April amounted to 1.5% and was the largest decline yet recorded for construction costs since the beginning of the general fall in prices. Building material prices for frame and brick houses likewise have declined since the latter part of 1929 and in April were lower than at any time since the World war.

Total awards of concrete pavements for May were 12,302,864 sq. yd. and for the five months ended May 30 total awards were 75,950,895.†

*Abstracted from the *Survey of Current Business.*

†Figures furnished by Portland Cement Association.

Motor-Truck Delivery System

Of the Consolidated Rock Products Co., Los Angeles, Calif.

By Edmund Shaw
Contributing Editor, Rock Products

THE Consolidated Rock Products Co., Los Angeles, Calif., the largest producer of aggregate in southern California, has one of the best worked out systems of truck delivery that has come to my notice. The materials delivered are classified as "Rock" and "Sand" and "Building Materials," and at times the combined deliveries run to 15,000 tons a day. And when the market requires it, the system can be extended to handle a considerably greater tonnage with no additions other than the needed trucks and drivers.

Editor's Note

THE radius of distribution of rock products by motor truck is gradually being extended, so that, as Mr. Shaw points out, no one can now determine its economic limit. It is one link in a seemingly endless chain. Aggregates build roads over which more aggregates may be transported to build more roads.

Most producers have not developed truck delivery to the point of almost scientific exactness described in this article. Some will never be able to do so because of their smaller scale of operation; but there are at least suggestions in the system which will be helpful to all.

Long Distance Truck Deliveries

Long distance trucking with attached trailers is becoming so efficient that it is gradually doing away with delivery from storage bunkers located on the railroads. Here are the figures from an actual job:

Railroad freight per ton, plant to bunker	$0.50
Bunkerage, or yardage	.20
Trucking from bunker to job	.40
Total	$1.10

The cost of delivering this same material to the job directly from the plant by truck and trailer was $0.90, a clear saving of $0.20 a ton. The distance was 25 miles.

No one could tell me just the distance at which freight, bunkerage and trucking from bunker to job became cheaper than direct trucking. The limit has been tentatively set from time to time, but no sooner was it set than a job came along that extended it. At the present time direct deliveries are being made to several highway jobs on which the hauls average 26 miles.

Organization

The transportation department is a branch of the company's production department, all of which is under the supervision of L. L. Rogers, vice-president. Earl Smith is in charge of transportation and Malcolm McIntyre is his assistant. Following is a chart of the production department showing how the transportation department ties into it:

DISTRIBUTION MANAGER

ASSISTANT DISTRIBUTION MANAGER

Warehouseman
Carload distributor
Bunkerman
Stenographer

Truck dispatcher
Tire adjuster
Order clerks

Division truck superintendent

Drivers
Dispatcher
Servicemen

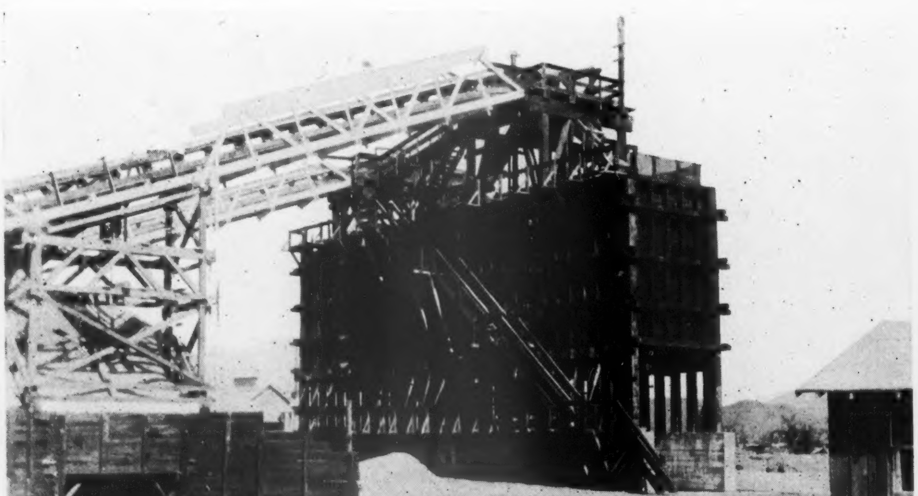
Mechanical supervisor

Foreman

Mechanics
Electrician
Welder
Painter
Storekeeper

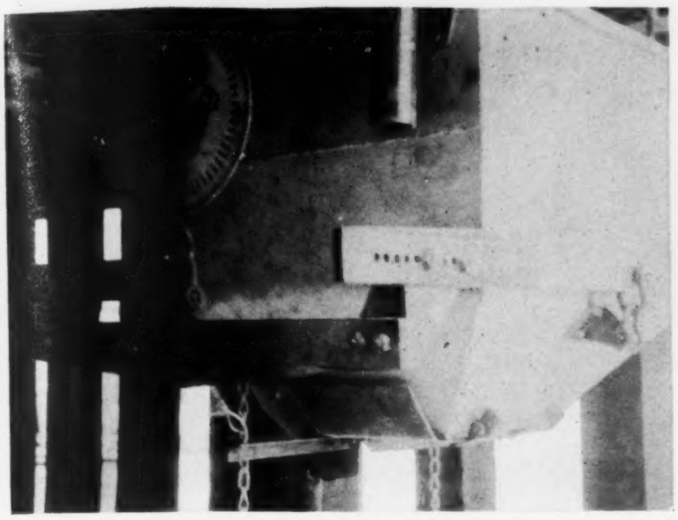
Washers
Greasers
Tire man
Gas station man

The Consolidated Rock Products Co. was a merger of several smaller companies, each of which had its own delivery organization. After the consolidation was effected a study of the situation showed that the best service could be given by a transportation division in the center of a group of plants. Three division headquarters were established. The Western division is in a group of plants in the San Fernando valley. Approximately



The batcher bunker, 90 by 16 ft. in size, holds 1500 tons of material and is divided into four compartments

Each bin has three gates, served by batchers on rails



Close-up view of batcher, which will weigh up to 3000 lb. by 5-lb. steps

Arriving at the job, the truck leaves the trailer and delivers its load

125 trucks are stationed there at all times. The Eastern division is also in the center of a group of plants and about 100 trucks are stationed there regularly. The Alemeda street division is in the southeast portion of the city of Los Angeles. There is one producing plant there and storage bunkers which are filled by rail shipments from other plants and these keep 40 trucks busy continually.

In case of a heavy demand for material out of any one division, trucks are shifted to it to meet this demand. In order that such changes will not represent a dead loss to the company, it is usually figured to have these trucks haul a load somewhere in the direction of the division to which they are going.

The Eastern division is about 15 miles on one side of the city and the Western division about the same distance on the other side. If these are taken as centers and circles of 25 miles diameter drawn it will be found that a very substantial part of the thickly inhabited portion of the Los Angeles district is included in them. And the circles overlap where the greater part of the deliveries have to be made; that is, the locality where most material is wanted may be served equally by both divisions.

Each division has its own repair and maintenance garage, which has its shop foreman; and he looks after the necessary mechanical repairs and also the painting, greasing and washing. The shop foremen come directly under a mechanical supervisor whose supervision covers all three divisions.

How the System Works

All orders are received at the main office of the company at 7th and Los Angeles streets, Los Angeles, and there they are cleared, that is, assigned to the division which is to make the delivery.

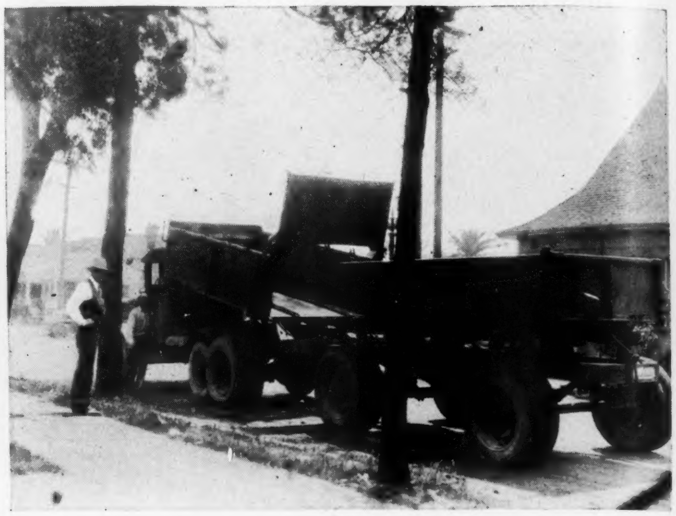
The speed and efficiency with which deliveries are made depend very largely on the way the work is handled by the division dispatcher and his assistants. They begin to receive orders from the main office for the next day's delivery about four o'clock in the afternoon, which come in over private wires. As each order is received and entered a separate ticket is made to accompany it. This is called a dispatch ticket. The dispatch tickets are given to the drivers the next morning. They take them to the plants as directed and receive the loads the dispatch tickets call for. With these they receive the regular scale tickets, which are made out in quadruplicate. Two copies the driver takes with him, one of which is to be signed at the point of delivery by the customer. This ticket has stamped on it the time the driver left the plant, and when he returns the time he got back is also stamped on it. This completes the record of the delivery of a particular load.

At the end of each day every driver assembles the tickets for his deliveries and fills out a summary form. This shows the driver's name, his truck number, the addresses of the various jobs to which he made deliveries, the meter readings that show the mileage and gas and oil consumption and the reasons for delays, if any. This gives a complete record of the work done by every truck. The delivery tickets are forwarded to the accounting department and arrive

Empty truck backs up to trailer and pushes itself under loaded body

Truck with trailer body inside is dumped in the usual way

Truck ready to return body to trailer chassis



Coupling empty truck and trailer before returning to plant

before that organization goes on duty, which makes it possible for the customer to be invoiced for material received the previous day.

As has been said, much depends on the dispatcher. It takes a very thorough knowledge of the territory, and especially the time required to complete deliveries at different points, to lay out the work. A record is kept by which the actual delivery is checked against the dispatcher's knowledge of the time it should take. To show how this works out: In looking over this record I noted, for example, that truck No. 230 left at 6 a. m. and was expected to be back at 9:30 a. m. It was. It left again at 9:45, being expected back at 11:05. It was back at 11:00. On the afternoon run the record showed that this truck was 15 minutes late on one delivery, but the driver's record showed clearly that he was prevented from dumping for 15 minutes by some trouble on the job.

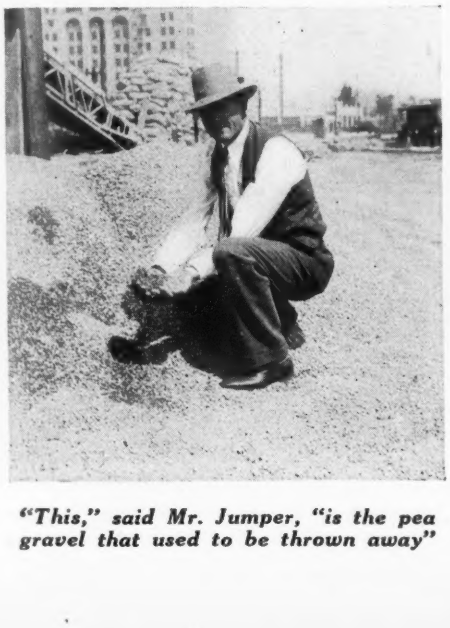
Equipment

Practically all the trucks used by this company are six-wheeled with pneumatic tires and they carry 10-ton loads. Nearly all the standard makes of trucks are represented in the fleet. Due to differences in tare weights they vary considerably in the pay load they will carry, and I asked which type was considered the most profitable. It seemed to me that, as deliveries were all made over highly improved roads, the lighter types would stand up well enough and give a higher pay load. I could not get any authentic figures on this but the impression I gained was that the sturdier and heavier types had been found more profitable in the long run.

The trailers used are pneumatic tired and of two types, one carrying 8 tons, the other 10 tons. The 8-ton trailer is the newer type and is considered the more economical, first, because there is less capital invested, and second, because it handles much better on the road and saves considerable time over the heavier type. And it causes less obstruction to traffic.

On one job which I visited when getting the material for this article, trucks with trailers were hauling 23 miles, from the plant directly to a central mixing plant on the job. I found that the trucks pulling the lighter, 8-ton trailer took only 15 minutes longer to complete the trip than the 6-wheel trucks without trailers. The trucks with 10 ton trailers took approximately 25 minutes longer. The 10-ton trailer has a total weight, loaded, of 34,000 lb., which means that 59% of its weight is pay load. The 8-ton trailer weighs 22,000 lb. loaded, as the body and chassis can safely be made lighter in proportion, so 72% of its load is pay.

The trailers are all made under the Fager patent. Some of them are manufactured by the Fager company and some by the New Comer Co., of Los Angeles. Trucks with this type of trailer can make deliveries to any point where a truck could go alone. The way this is done is as follows: The truck driver stops at some point near the job and detaches the trailer and sets the air; then he takes the truck and its load and makes that delivery. He returns and backs up to the trailer and by a small amount of maneuvering, mostly pulling ahead and backing up, the body of the trailer is shoved into the truck body and clamped there to prevent it from sliding out. This is taken to the job and dumped as though it were a load on the truck bed. Then he goes back to the trailer chassis, uncouples the clamps and slips the body back. After coupling up the air and making the trailer body fast he is ready to leave again. The whole change takes approximately five minutes.



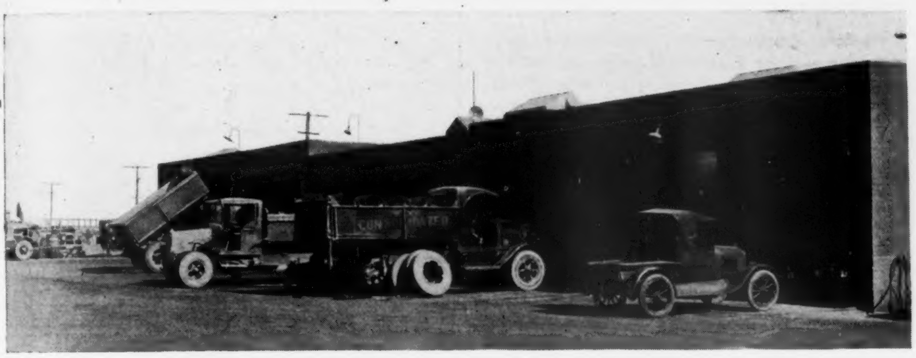
"This," said Mr. Jumper, "is the pea gravel that used to be thrown away"

Not only the trucks but the equipment for loading them is important for efficient work. A number of different arrangements are in use at the various plants of the company, for every company had its own loading scheme when the consolidation was formed.

Efficient Truck Loading

What is considered one of the most satisfactory arrangements for truck loading was shown me by Mr. Jumper, the company's engineer, who had just completed the construction of a set of bins, or a bunker, for batching. It is 90 ft. long, and 16 ft. wide outside and it contains five bins, each holding approximately 500 tons. Two bins are for sand; the remaining three are for "No. 1," "No. 23," and "No. 4" gravel. These are the usual components of the so-called "four-way mix," which is now used for city, state and county jobs and for many of the larger private constructions. Each bin is fitted with three bottom gates and a rail runs along both sides of these gates. From the rails a batcher is hung from a frame with wheels, so that it can be moved under any gate. There is one batcher for each bin, however. The batchers are made under the Rucker patent by the Bodinson Manufacturing Co. They have a capacity of 3000 lb. and the weight is shown on white faced dials to the nearest five pounds. These scales are inspected, tested and sealed by the county sealer of weights and measures every 60 days.

Crane on monorail lifting batch gates from trucks. Note gates stores at ends



Repair and maintenance garage at western division

The gates from which the batchers are filled are controlled by levers from platforms. They are arranged so that the flow cuts off positively and the loader can weigh accurately within five pounds. The object of having the three gates and a movable batcher is, of course, to reduce the dead storage.

Open Storage of Coarse Aggregate and Sand

Unbatched coarse aggregate is taken from open bins or from stockpiles. But sand is stored over a large tunnel, big enough so that a truck has plenty of room to drive through. The top of the tunnel is crowned to throw the water off and a small pump placed at a sump on the inside takes care of any drainage or seepage. The floor of the tunnel is of concrete but the sides are of timber. Mr. Jumper said this was a very satisfactory method of storing and handling sand, as the drainage was efficient and the sand could be loaded rapidly. He thought that the only change he would make in building another would be to use reinforced concrete for the entire structure.

Batched and "straight" loads of material are handled by the same trucks. The batch gates are detachable and are lifted in and out by a small traveling crane on a monorail track. There is one of these at each division. The crane carries the gates to a storage space, and each gate is numbered the same as the truck to which it belongs, as it is important that the truck gets the same gates every time.

When the four-way mix is used the contractor must furnish some means of binning or stockpiling the four sizes. Some of the accompanying photographs show the system used on a street paving job, a bunker with four compartments, each being fed by its own elevator, one on each side of a square. From each compartment a chute leads into a batcher which is fixed on a scale so that the amount of each material may be weighed in. The engineer in charge samples the material as it is delivered and sieve analyses are made, and from these the percentage of each component is figured. The basis for calculating the percentages is a gradation curve, which, I was told by the engineer at the job, resembles Fuller's curve, in that the gradation of the cement is figured into the gradation of the whole.

The specifications for the three gravels are:

No. 1	%
Pass. 2½-in.	80-100
Pass. 2 -in.	45-65
Pass. 1½-in.	10-30
Pass. ¾-in.	0-5
No. 23	%
Pass. 1½-in.	90-100
Pass. ¾-in.	40-65
Pass. ¼-in.	0-7
No. 4	%
Pass. ¾-in.	100
Pass. ½-in.	80-95
Pass. ¼-in.	10-40
Pass. 10-mesh	0-5

The mix on this job was: No. 1, 40%; No. 23, 26%; No. 4, 4%; sand, 30%. This was unusually high in No. 1 and low in No. 4, the reason being that No. 23 was running exceptionally fine. This product has such a wide range of sizes that it must vary from plant to plant and also from day to day in the same plant. The way that these variations are compensated is adding more or less pea gravel, that is, No. 4. The same pea gravel is also used to increase the coarseness of the sand when it is running fine, so the once despised pea gravel is now a most important component of the mix. At times as much as 15% of this material is used.

Efficiency Without Hurrying

We were at the Western division headquarters when the trucks were coming in after the day's work. It was a busy place but there was no disorder or confusion. The trucks were parked with military precision; the drivers lined up to make out and present their daily reports. Inside the office the orders which were coming in by telephone were being studied and grouped so that the next day's deliveries could be started without any delay. Efficiency without hurrying; that is the test of any organization.

Sand stored and drained in stockpile over tunnel

Rate of Calcination of Limestone*

By C. C. Furnas

North Central Experiment Station, U. S. Bureau of Mines, Minneapolis, Minn.

IN THE United States alone approximately 5,000,000 tons of limestone per year are burned for use as lime, 20,000,000 tons are calcined in metallurgical furnaces to be used as flux and several times this much, of the order of 75,000,000 to 100,000,000 tons, are calcined in the manufacture of cement. Yet there is but little information available on the rate at which calcination takes place. As far as the author knows, there are only three published investigations on the matter. In the first (*2*), the data were very meager and indefinite. The size of material used was not specified, and other attending conditions of the system were not mentioned.

In the second (*3*) it was apparently assumed that heat transfer and calcination were synonymous or, more correctly, that they occurred together, which is not necessarily true. A particle of limestone may acquire a calcining temperature and remain that way for a long time before calcination actually takes place. This second paper, then, is a clever correlation of the data of temperature acquisition in limestone, but its applicability to lime burning is doubtful.

In the third piece of work (*7*) nine different limestones were calcined at various temperatures for varying lengths of time. The data show the relative ease with which different limestones may calcine, but the actual rates reported are hardly applicable to burning limestone in practice, for the material used was mostly of small size (—4-mesh) and the calcining was done in porcelain crucibles heated from the outside. The results obtained are really those for a confined bed of fine material and do not give much information as to the specific rate of calcination within the limestone itself. It may be said, however, that none of the data reported in Linzell's paper are qualitatively different from those of this present paper.

Because of its importance in the heat-transfer phenomena of the blast furnace, the Bureau of Mines has undertaken a short study of the rate of calcination of limestone, and the data are reported in this paper.

Summary of Results

The data obtained may be summarized in such a simple manner that it seems best to present a statement of the results first and then to offer the experimental proof just as in geometry a theorem is first stated and then proved.

Abstract

CALCINATION of limestone takes place in a very narrow zone which is the phase boundary between calcium carbonate and calcium oxide. This zone advances from the outside to the inside of the piece at a constant rate for each temperature, independently of particle size or degree of calcination. Curves and data are given for rates of calcination and temperature histories of the particles. Most of the resistance to heat transfer into the piece appears to be in the narrow zone of calcination, and not in the body of the calcined material. The calcination data may be used to determine the surface area of the particles.

Calcination proceeds only from the outside of the piece inwards over a very narrow zone, practically a line. The data reported in this paper are given as rates of advance of this line of calcination from the outside to the inside of the piece. As a first approximation, this line of calcination advances at a constant linear rate (measured in centimeters per hour), dependent only on the temperature of the surroundings and independent of size or shape of particle, degree of calcination or amount of previous heating.

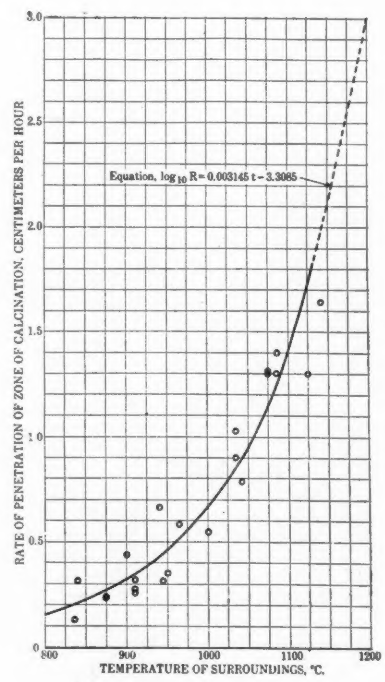


Fig. 1. Rate of penetration of line of calcination, related to temperature

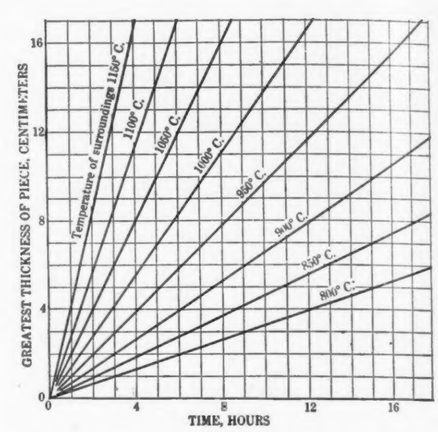


Fig. 2. Relation between time required for complete calcination, temperature, and thickness of particle

The summarized data are given in Fig. 1. The equation of the plotted curve is very simple, being

$$\log_{10} R = 0.003145t - 3.3085 \quad (1)$$

where R = rate of advance of the line of calcination in centimeters per hour

t = temperature, deg. C.

This equation is purely empirical and no theoretical importance should be attached to it.

Obviously, since the rate of penetration of the line of calcination is constant throughout the entire period, the length of time required to calcine is directly proportional to the size of the piece. In Fig. 2 are given computed curves for the time required for complete calcination of pieces of different sizes at different temperatures. The size is defined as the greatest thickness of the piece, where thickness is defined as the smallest of the three dimensions as contrasted with breadth and length.

This makes the problem of time of calcination a very simple one. Undoubtedly, particle size and degree of calcination do have an effect on the rate, but under the conditions of size and temperature studies these effects, if they were there, were not of sufficient magnitude to appear above the normal variation of the data. The particles varied from an equivalent spherical diameter of 2.5 to 8.5 cm.; the degree of calcination, from 39 to 100%. Without further experimental work, confidence should not be placed in these data for particles less than 1 cm. or greater than 15 or 20 cm. in diameter.

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Details of Experiment

The study was divided into two parts: (1) calcination when hot gases flow through a bed of particles, and (2) calcination of single pieces in a graphite-walled induction furnace. The latter experiments were conducted at a higher temperature than could be obtained with the gas-flow apparatus.

The gas-flow apparatus was the same that had been used previously for heat-transfer determinations (*1*), and is shown in Fig. 3. Briefly, hot gases from the pot furnace, *F*, are pulled through the column of broken solids, *C*, and the temperature histories of the gas stream at the top and the bottom of the column are recorded by thermocouples T_2 and T_1. It was found that the experiments could be conducted equally well by using a shielded gas burner in place of the pot furnace.

In addition to the thermocouples indicated in Fig. 3, the beads of two additional thermocouples were placed in the center of pieces of limestone on top of the column. A hole would be drilled through the stone, one of the wires pushed through, butt-welded to the other wire, and the junction would be pulled back to the center of the piece. These gave the temperature of the center of the piece.

For the experiments above 1000 deg. C., a 35-kilovolt-ampere Ajax-Northrup induction furnace was used. The heating element was a hollow graphite cylinder, 8 cm. inside diameter. In making a run, the furnace would be heated to somewhat above the desired temperature and then a single piece of limestone would be suspended in the center of the furnace, one thermocouple imbedded in the center of the piece and another placed on the surface. Every effort was made to keep the surface temperature constant. During experiments the carbon dioxide evolved from the limestone would be partially converted to carbon monoxide by the graphite walls and would burn at the top of the furnace.

Records were kept on a Leeds and Northrup multiple-point recorder.

The temperature history of the gas stream at the top of the column in the gas-flow experiments affords a means of determining the heat-transfer coefficients from the gas stream to the column of material (*1*).

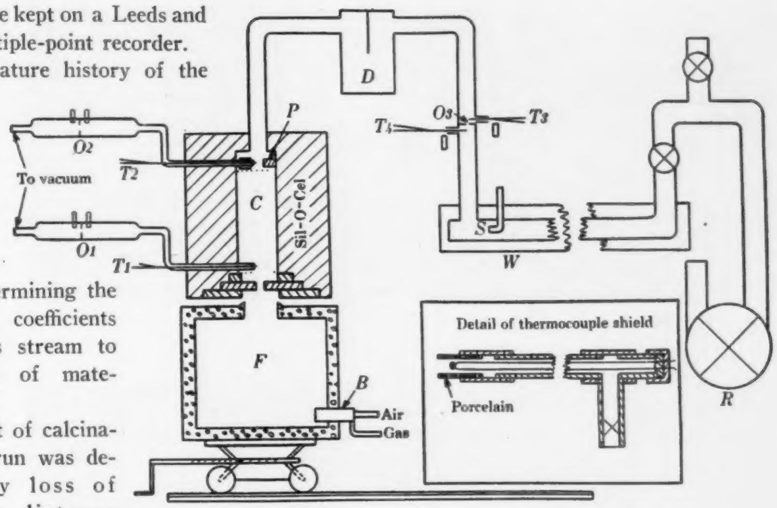

Fig. 3. Heat transfer equipment

The amount of calcination after a run was determined by loss of weight. The distance which the line of calcination had penetrated was determined by averaging a great many measurements of the width of the calcined band.

The limestone had the following analysis:

	Per cent.		Per cent.
CaO	54.33	Al_2O_3	0.30
Fe	0.36	CO_2	43.10
SiO_2	0.50	Loss	43.10
MgO	1.14		

The complete operating and computed data are given in Table I. These data show wide variations of particle size and degree of calcination. In one of the runs the limestone was preheated before putting it into the furnace. A careful study of the complete set of data shows that none of these variables has a consistent, significant effect. It is very probable that continued, careful experimentation would give results which were reproducible enough to show small variations with the other variables, particularly if a greater size range were studied.

Limestone decomposes according to the reaction

$$CaCO_2 = CaO + CO_2 \ldots \quad (2)$$

The reaction is endothermic, absorbing about 43,000 calories per formula weight. It can be shown by theoretical considerations that such a reaction cannot take place, except at the boundary between these two phases (*6*). Since the two solid phases are fixed in position, it might be expected that the line of calcination would start at the outside of the piece and advance inward. If there were chance calcium oxide molecules on the interior of the piece and the necessary heat were available at that point, then centers of calcination might start at various places on the interior of the piece. However, several hundred pieces were examined and in every one calcination had proceeded by the advance of a definite line or phase boundary from the outside toward the center.

Distinction Between Calcined and Uncalcined Material

The calcined portion is always soft and pure white. The uncalcined portion remains hard and is gray, probably owing to the presence of traces of unoxidized carbon from

TABLE I. DATA ON HEAT TRANSFER AND CALCINATION OF LIMESTONES

Max. Temp. Deg. C.	Run	Av. equiv. spherical diameter of particle Cm.	Time Sec.	Weight loss during run Per cent.	Calcination completed Per cent.	Av measured depth of penetration of calcination Cm.	Computed rate of penetration Cm./sec. × 10^4	Computed rate of penetration Cm./hr.	Rate of gas flow Std. l./sec./sq. cm.	Coef. heat transfer gas to solid*
				A—Gas Flowing Through Columns of Material						
835	163C	4.1	8100	30.7	72.2	0.29	0.36	0.13	0.08	0.0016
840	162	2.5	5400	25.0	58.0	0.45	0.84	0.30	0.13	0.0047
875	166C	7.3	10190	30.5	70.8	0.64	0.62	0.22	0.08	0.00065
875	166D	7.3	10190	30.5	70.8	0.66	0.65	0.23	0.08	0.00065
900	163B	4.1	8400	30.7	71.3	0.82	0.98	0.35	0.08	0.0016
910	165C	6.3	7500	32.6	75.6	0.52	0.69	0.25	0.08	0.00078
910	166B	7.3	11100	30.5	70.9	0.84	0.76	0.27	0.08	0.00065
910	165E	8.0	7500	18.6	43.2	0.80	1.07	0.38	0.08	0.00078
940	164A	3.0	3900	26.2	60.8	0.71	1.83	0.66	0.13	0.0032
945	166A	7.3	12000	30.5	70.9	1.05	0.88	0.32	0.08	0.00065
950	165B	6.3	8100	32.6	75.6	0.79	0.98	0.35	0.08	0.00078
965	163A	4.1	9590	30.7	71.2	1.55	1.62	0.58	0.08	0.0016
1000	165A	6.3	8700	32.6	75.6	1.32	1.52	0.55	0.08	0.00078
				B—Single Pieces in Induction Furnace						
1035	170	7.3	5940	37.2	86.3	1.48	2.50	0.90	......	....
1035	176	4.0	3480	43.1	100.0	1.0	2.87	1.03	......	....
1040†	169	4.0	5940	37.1	86.0	1.3	2.19	0.79	......	....
1075	171	6.6	3300	35.2	81.5	1.2	3.63	1.31	......	....
1075	172	5.7	1800	25.8	59.8	0.65	3.61	1.30	......	....
1085	173	4.6	1800	36.9	85.5	0.65	3.61	1.30	......	....
1085	174A	3.6	900	31.2	[illegible]	0.35	3.89	1.40	......	....
1085	174B	3.7	900	31.7	73.5	0.35	3.89	1.40	......	....
1125	175	5.6	3600	37.8	87.6	1.30	3.61	1.30	......	....
1140	168	6.0	3300	39.8	92.2	1.50	4.55	1.64	......	....

*Measured in calories per second per deg. difference per cu. centimeter of bed.
†Limestone was preheated to 500 deg. C. before putting it into the furnace.

Fig. 4

Fig. 5

Figs. 4, 5 and 6 are cross sections of typical pieces of partially calcined limestone

organic matter. Figs. 4, 5 and 6 show cross sections of typical pieces of partially calcined stone. The division line between the two phases is very sharp. Fig. 6 is the photograph of a piece which was ground into the shape of a sphere. The dark, uncalcined portion has retained its spherical shape, showing that the phase boundary advances uniformly in all directions.

The dark appearance of the central portion is not sufficient proof that their areas are uncalcined. However, several samples were taken at various positions in the dark regions and calcined in platinum crucibles. All samples showed full loss of weight, indicating that no calcination had taken place inside of the white band.

One investigator (*4*) has reported that there is a zone of partially calcined calcium carbonate inside of the completely calcined portion. If this is true, the zone is very narrow, for none of the samples of this investigation showed any such partial calcination close to the phase boundary.

Temperature Advances Faster Than Calcination

It is particularly important to note (Table I) that the rate of advance of the line of calcination is quite slow, much slower than the rate of advance of a temperature wave. Temperature acquisition at the center of a piece occurs long before calcination takes place. This means that the portion of the piece inside of the calcined zone is always in a metastable condition, but still unable to decompose until the phase boundary advances to it.

The limiting factor in the rate of calcination at low temperatures is the inherent rate of advance of this boundary line of the two solid phases, the center of the piece coming up to the temperature of the outside far ahead of calcination. However, as the temperature of the surroundings is raised, the specific rate of advance of the phase boundary is so increased that resistance to heat tranfer begins to have an effect and the center temperature, although it is sufficiently high for calcination, lags behind the outside temperature until calcination is completed. This means that, after the temperature reaches a certain point, the 43,000 calories per formula weight being absorbed at the phase boundary are being demanded so rapidly that no additional heat gets past the boundary to go into the center of the piece.

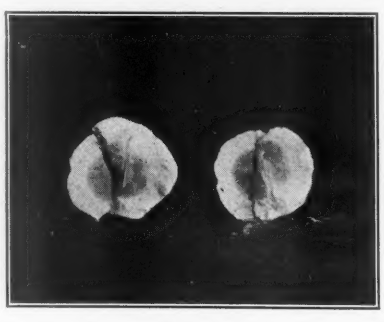

Fig. 6

Temperature of Interior of Pieces

These two effects are shown in Fig. 7. At the lower temperature (curve *B*) the temperature of the center rose to that of the outside in the usual manner for the heating of a solid body. However, calcination lagged far behind this temperature, for it was only 72% complete after 160 minutes of heating.

At the more elevated temperature the center came up to a definite temperature and stayed there while calcination proceeded. At various places in the literature it will be found that "calcination temperatures" are reported as being from 900 deg. to 950 deg. C. In the run under consideration the temperature in the center remained constant at about 940 deg. C. It is evident, then, that this so-called "calcination temperature," which apparently is meaningless because calcination theoretically should proceed at any temperature if the carbon dioxide pressure is low enough, is actually a measure of the temperature which the center of a piece maintains while calcination is proceeding at more elevated temperatures.

The difference in the temperature histories of the surface of the pieces in runs *A* and *B* is due to the fact that run *A* was a single piece in an induction furnace, the surface temperature coming up almost at once. Run *B* was that of a piece at the top of a bed of material and the whole bed had to be heated before the top piece acquired temperature.

From a consideration of Fig. 7 it would seem that, if the outside of a piece is heated to some temperature greater than 1000 deg. C., then the center should maintain a constant temperature between 900 deg. and 950 deg. C. until calcination of the piece is complete and then it should rise to the temperature of the outside. This is exactly what happens, as is shown in Fig. 8. This curve is for the temperature history of a piece which was completely calcined before being taken from the furnace.

Calcination Not Analogous to Heat Transfer

From the preceding discussion it can be seen that it is erroneous to consider that heat flow and calcination are analogous (*3*). If the external temperature is below 950 deg. C., then the center acquires temperature much ahead of calcination. If the external temperature is greater than 950 deg. C., then the arrival of the center temperature to that of the outside is evidence that calcination is complete to the center, but the tem-

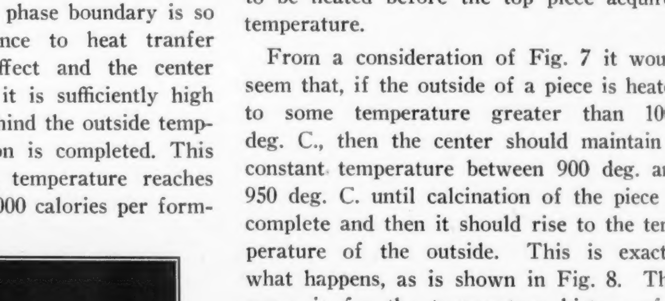

Fig. 7. History of surface and center temperatures of typical pieces of limestone during the calcining period at different temperatures

perature history has not been in any way similar to the simple heating of a body.

Carbon Dioxide Pressure

The runs that were made at low temperatures were for the system where gas flowed through a column of broken limestone. The total pressure was approximately atmospheric and the carbon dioxide was 5 to 10%.

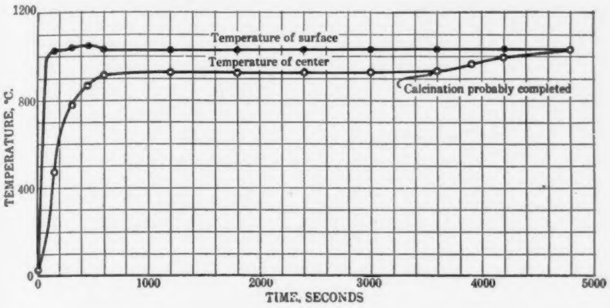

Fig. 8. Temperature history for complete calcination at elevated temperatures

No significant variations could be found with variations of the carbon dioxide percentage.

In the high-temperature runs the pieces were placed in a graphite-lined induction furnace. The total gas pressure was 1 atmosphere. The gas evolved in the furnace then was 100% carbon dioxide, but it was in contact with hot graphite and was partially converted to carbon monoxide. The percentage of carbon dioxide in the gas ranged from 30 to 50%. No significant variations which could be attributed to difference in gas compositions could be found between the high- and low-temperature runs.

Probable Driving Force of Reaction

It seems reasonable to suppose that the major driving force of the calcination is the equilibrium carbon dioxide pressure of the calcium carbonate. If this is true, the rate of calcination might be expected to be approximately proportional to the equilibrium carbon dioxide pressure.

Measured equilibrium carbon dioxide pressures for calcium carbonate are shown in Fig. 9 (*5*). It will be observed that the shape of the curve, when related to temperature, is the same as that for rate of calcination as shown in Fig. 1. However, the sharp rise in the equilibrium carbon dioxide curve begins at a lower temperature than the corresponding rise in the rate curve. This would indicate that another factor besides the carbon dioxide pressure tends to limit the speed of reaction. As pointed out before, this limiting factor at elevated temperatures is probably the resistance to heat transfer. So there are two tendencies in calcination, specific rate of advance of phase boundary and rate of heat transfer, which are alternately controlling factors in the rate.

Fortunately for simplicity of the problem, as a first approximation, the rate of advance of the calcination zone for all temperatures is constant and independent of the size of the piece. This independence of particle size indicates that the resistance to heat transfer is for the most part at the line of calcination and not throughout the body of the calcined material.

Rate of Carbon Dioxide Evolution

In some instances it is important to consider the rate of evolution of carbon dioxide during the course of calcination. Obviously, if the line of calcination advances at a constant rate, this rate of gas evolution is proportional to the area of the calcined surface, which decreases as the reaction proceeds toward the center. If the particles are considered spheres, then the rate of gas evolution for pure calcium carbonate will be given by the equation

$$\frac{dG}{d\theta} = \frac{4\pi Rd\, 22.4}{100}(r - R\theta)^2 \qquad (3)$$

$\frac{dG}{d\theta}$ = rate of gas evolution from one piece in liters per hour.
θ = time in hours since beginning of calcination.
R = rate of calcination as determined by Equation 1.
r = outside diameter of particle.
d = specific gravity of limestone.

This equation may be written

$$\frac{dG}{d\theta} = 2.82Rd(r - R\theta)^2 \qquad (4)$$

This study furnishes a means of making an approximate determination of the surface area of irregular pieces of limestone. If a piece of limestone is calcined for a short distance inward, the volume of calcined material is approximately the surface area times the thickness of the calcined layer. The amount of calcination—that is, the volume calcined—is determined by loss of weight. The boundary of the calcined zone is very sharp and uniform around the piece. After breaking the piece, the thickness of this zone may be determined by the average of several measurements. Dividing this average thickness into the volume calcined gives the surface area. A number of such determinations were made. It was found that for irregular pieces the surface area was 20 to 50% greater than for a sphere of equal volume.

Rates of Calcination of Limestones

In order to determine the effect of composition of limestone upon the rate of calcination, two samples of two other limestones used in commercial blast-furnace work were calcined. The samples were ground into the form of spheres, 5 cm. in diameter, and the rate of calcination was determined in the induction furnace. The data on the two samples are given in Table II.

By referring to Fig. 1, it can be seen that these rates are distinctly greater than that of the average curve given there. In all probability this increased rate is due to the presence of the greater percentage of magnesia (4.38 and 9.25%, as compared with 1.14% in the first limestone). The dissociation pressure of magnesium carbonate is many times that of calcium carbonate at the temperatures considered, and hence might be expected to increase the rate of reaction quite appreciably.

TABLE II. DATA ON CALCINATION OF LIMESTONES

	Sample A	Sample B
Analysis:	(per cent.)	
CaO	49.60	43.40
MgO	4.38	9.25
SiO_2	0.52	0.26
Al_2O_3	0.05	0.11
Ignition loss	44.60	45.00
Diameter of sphere, cm.	5.2	5.1
Specific gravity	2.66	2.55
Temperature of calcination, deg. C.	1075	1050
Rate of calcination, cm. per hour	1.55	1.77

It is evident that, for limestones which are quite different from the one studied, tests should be conducted to determine their specific decomposition rates. This could easily be done by placing one or more spheres of limestone in a muffle furnace, at 1000 deg. C., and the rate of calcination determined by loss of weight after a certain time (about 1 hour). It would be necessary to keep the temperature of the furnace controlled quite accurately, as the temperature has the major effect upon rates of calcination.

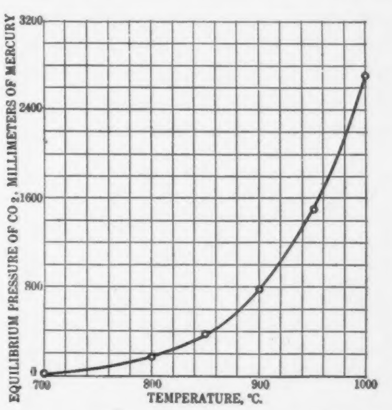

Fig. 9. Johnson's data of equilibrium carbon dioxide pressures in the decomposition of calcium carbonate

After the rate was determined for one temperature, the rates for other temperatures can be estimated from Fig. 1.

The author wishes to acknowledge the aid and suggestions of T. L. Joseph, H. F. Holbrook, and E. P. Barrett, of the U. S. Bureau of Mines.

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Opportunities for Using Indicating and Recording Control Instruments in the Rock Products Industries

Part IV—Application of Instrumental Control in the Automobile Industry—Continued

By James R. Withrow
Chairman, the Chemical Engineering Department, the Ohio State University

TEMPERATURE AND HUMIDITY are two of the most important factors in lumber drying. With the use of a kiln or dryer, it is possible to maintain proper drying conditions independent of weather fluctuation, thereby controlling the drying process and the final moisture content, saving much time and investment in the processing of lumber.

Temperature inside the kiln governs the rate at which moisture travels through the fibers of the wood. Too low temperature retards drying, and results in the loss of time. Too high a temperature is liable to injure the wood, and wastes heat.

Humidity, or the amount of moisture in the air (determined by the wet and dry bulb temperature) affects the rate at which the moisture is evaporated from the surface of the stock and the extent to which the wood will dry. If the air is very dry, or the humidity too low (the wet and dry bulb temperatures are far apart), excessive evaporation occurs, which causes the fibers to become stiff and dry, resulting in extreme case-hardening. This condition causes unequal stresses in the boards, which if allowed to continue results in such defects as checking, warping, and honeycombing. If the air in the kiln is too moist, or the humidity too high or the temperature low, drying is retarded, resulting in loss of time. The kiln operation is then made very expensive.

Regardless of the operator's experience and skill, it is *impossible* to maintain a proper drying condition inside the kiln by manual adjustment of spray and heat line valves. For proper drying, automatic control of the drying conditions is required.

The Ford Motor Car Co. requires 1,000,000 board feet of lumber per day. Green lumber is received. The problem is to remove the moisture from the wood, in the shortest time possible, without impairing the quality of the stock being dried and with the minimum of steam consumption and kiln supervision. By the use of proper temperature and humidity instrumentation control, this company estimates that it *saves at least one half million dollars per year* over the manual control methods.

The driers or kilns are equipped with automatic temperature and humidity controllers which consist of two thermometers. One thermometer controls the temperature of the kiln and is called a dry bulb thermometer, while the bulb of the other thermometer is always kept wet by a wick, to record the wet bulb temperature. The difference between these two temperatures indicates the relative humidity of the air.

Two diaphragm valves are connected to the instrument, one being installed in the line supplying the steam to the heating coils, the other in the steam-spray line which supplies the moisture. Change in the kiln temperature surrounding the dry bulb causes a coil spring in the instrument to open or close an air valve. This valve in turn allows more or less air to pass to the diaphragm valve installed in the heating coil line, holding it open just enough to admit

Figs. 5 and 6. Typical bulb locations inside drying kilns, using two bulbs, one for dry and the other for wet measurement

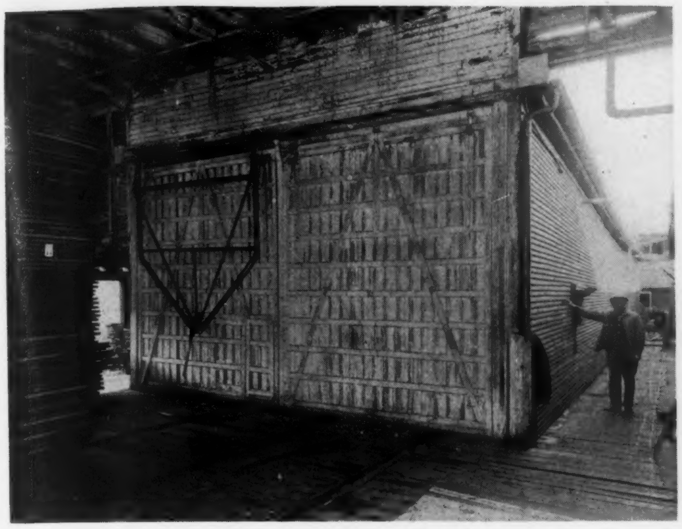


Fig. 7. The man is pointing to pipe feeding water to evaporation tank for wet bulb

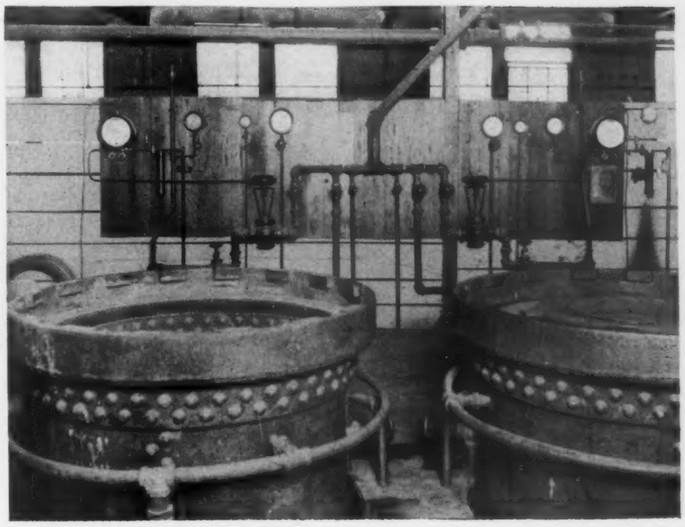


Fig. 9. Temperature recorders and controls in a plant for vulcanizing rubber tires

Author's Note

HAVING SHOWN in the previous article reasons why instrumentation has developed great strides in industry, its universally growing use, the value of instrumentation to both labor and management, and the limitations, it was shown how instrumentation can revolutionize an industry using the definite case of modern developments in automobile finishing.

To further show just what the application of instruments does for those industries where it is known to be of great advantage, applications in the modern production of automobiles are given in this article, covering lumber seasoning, tire manufacture, and chromium plating, and showing just what savings result.—The Author.

the quantity of steam required to maintain the desired temperature. The amount of humidity in the kiln is similarily regulated by changing the relative humidity in the kiln, which affects the wet bulb, causing the instrument to open or close the spray-line diaphragm valve as required. That part of the instrument which records the wet bulb and dry bulb temperatures is operated by the same coil springs that operate the regulating mechanism. Thus, the slightest change in temperature inside the kiln, from such causes as fluctuation of steam pressure or of outside temperature, are instantly compensated automatically. The controller may be set at the will of the operator, with confidence that the desired conditions will be maintained. Thus, uniform drying is assured with a minimum of steam consumption and kiln supervision. The operator is relieved of the necessity of constantly watching the kiln. The instrument also makes a record of the temperature and humidity, and gives the operator a continuous check on the drying time and conditions. Obviously the financial saving is very great over manual control. It is evident that conditions necessitating close control frequently obtain in some rock products industries.

Fig. 8. Resistance thermometer with rotary switch by which the instrument can be connected at will to any of the bulbs throughout the plant

Figs. 5 and 6 are two views of the use of Brown resistance thermometers, showing typical bulb locations inside drying kiln. Note the two bulbs used in each case. One is for dry measurement and the other for wet. Comparison of dry and wet temperatures allows calculation of humidity. The Duplex bulb, which has one bulb surrounded by a wick, is now made to have a small fan used in connection with it to insure complete evaporation under the given conditions, to insure in turn correct readings of the wet bulb instrument.

Fig. 7 gives an exterior view of kiln with a man pointing to a small pipe through which water is fed to the evaporating tank for the wet bulb shown in Fig. 5.

Fig. 8 shows the installation of resistance thermometer with rotary switch, by means of which the instrument can be connected at will to any of the bulbs located throughout the plant. As this form of open switch is not so good, more modern switches are now generally used. This installation is correct, however. The principles and ideas are still the same. Details of application only have been improved.

Tire Manufacture

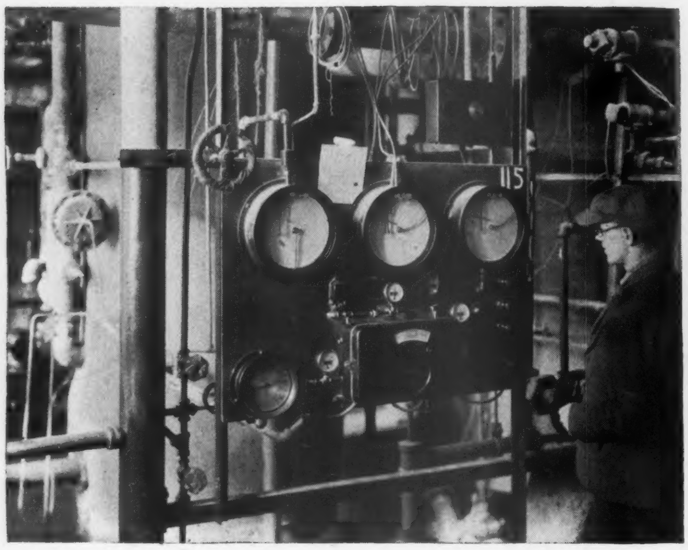
Before the introduction of organic accelerators into rubber compounding slight variation of temperature and time of curing did not make much difference in the finished product. Since the introduction of various kinds of organic accelerators the time of curing was greatly shortened at the same temperature. However, the curing operation became very delicate. Slight change of temperature of curing would ruin the whole thing.

The shortening of the time of curing means a saving of fuel and an increase in capacity of production, greatly reducing manufacturing cost. On the other hand the increase in the sensitivity of curing operation increases the risk of spoiling the product, so the optimum curing temperature must be rigidly controlled in order to utilize the accelerators to the fullest advantage.

The higher the speed of accelerator used the more sensitive to heat the curing operation becomes. Therefore, every step of the operation must be exactly scheduled.

One such schedule, for instance, calls for a gradual rise of temperature to 290 deg. F. in exactly 28 min., a "hold" for just 75 min. at exactly 290 deg. F., then the steam is blown-off quickly and the press filled with cooling water. Hand control wouldn't accurately maintain such a schedule.

The leading tire manufacturers therefore are using automatic temperature-time control instruments in their vulcanization



Figs. 10 and 11. Recording thermometers used in vulcanizing tires

processes because of the necessity of accurate temperature-time control.

During curing the clock controller is set so that at definite times definite valves will be opened, others closed. The thermometer control is set so that a definite temperature is obtained. Steam inlet and condensation outlet are controlled in unison during the curing period. At the end of the curing period, the steam inlet, and condensation outlet are closed simultaneously, the blow-off valve being opened at the same time (adjustments are set controlling the length of time this valve is to remain open).

The cooling water inlet is next opened at a set time and kept open for a set time. The blow-off is closed, at the end of the set time, and the cooling-water drain is opened simultaneously. The cooling-water inlet is closed, at the set time, after which the clock-mechanism stops. The machine works like a trained soldier and no skilled workman on the job can be blamed for results. They must be planned correctly in the office.

The apparatus is brought in position for the next run by closing the blow-off valve, cooling water inlet valve, and the cooling-water drain valve, and opening the condensation outlet valve, and the steam inlet valve. At the same time the clock-mechanism is started.

Fig. 9 (courtesy Foxboro Instrument Co.) illustrates temperature recording and control equipment connected with rubber tire vulcanizers of the Nu-Cord Tire and Rubber Co. in Pennsylvania.

Fig. 10 (courtesy Foxboro Instrument Co.) shows panel No. 115 with recording thermometers and tire vulcanizers of the Hood Rubber Co., Watertown, Mass.

Fig. 11 (courtesy Foxboro Instrument Co.) shows another board of instruments along with Republic flow meters at the Hood Rubber Co. plant.

In spite of the obvious simplicity of the instrumentation for each vulcanizer the aggregate investment in instruments is very heavy. Nevertheless the defense against otherwise inevitable irregularity in quality of product (inferior goods and dissatisfied customers) makes a saving that cannot be computed. This same principle applies repeatedly in the rock products industries.

The life of tires is absolutely dependent upon this precise automatic control. Slight variations of time or temperature affect the life of the product. Command of this detail saves car owners dependent on rubber tires at least $100,000,000 per year.

Through the use of instrumentation dependable and uniform tires can always be guaranteed, and with available testing instruments the strength, service and the life of the tire can be foretold. The producer actually knows how the tire will behave before it is shipped. Therefore, instrumentation in the tire industry or any industry is a safeguard to the manufacturer and protection to the consumer.

Chromium Plating

The automobile industry has shown that surfaces exposed to wear may be chromium plated with good results. However, if the surface treated is to be subjected to impact,

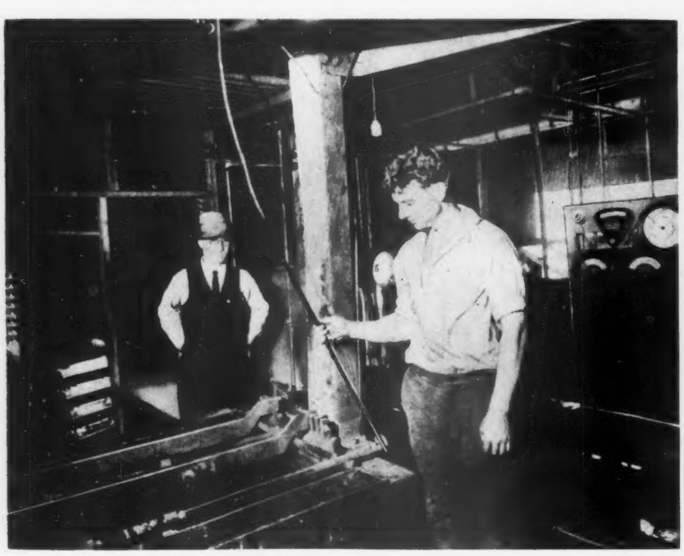


Fig. 12. Testing chromium plating vats for temperature

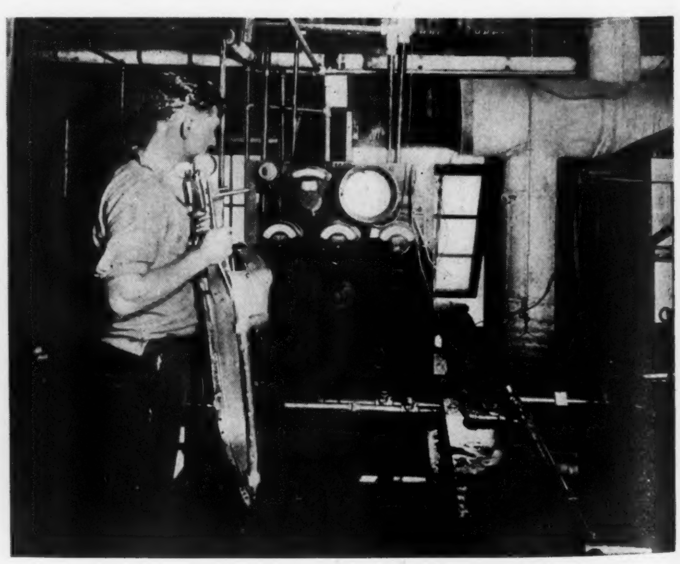


Fig. 13. Watching instruments as shields are inserted in vat

Fig. 14. Temperature control brings the parts from plating out in uniform appearance

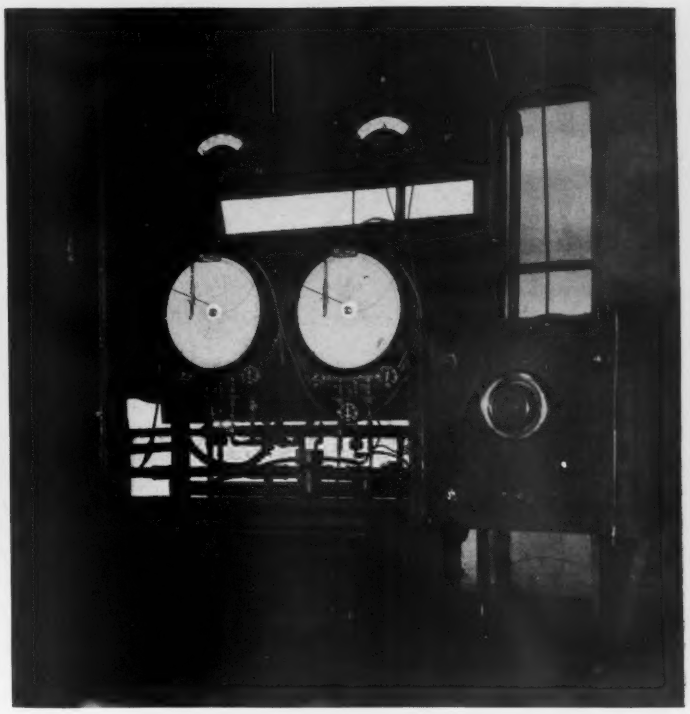


Fig. 15. Automatically controlling temperature of bath necessary for successful chromium plating

it should be carburized, or at least cyanided, before being chromium plated. Even the softer deposits of chromium plate are considerably harder than the hardest steel. In order to obtain satisfactory deposits of chromium plate on the work plated it is necessary that the temperature of the plating solution be kept at the point where plating efficiency is found most effective. For this reason close control of the bath temperature is essential. Automatic temperature control has been very successful in this work. The Nash Motors Co., Kenosha, Wis., finds that this control operates 100%.

Chromium Plating Would Be Impossible Without Close Control

In the installation shown in Figs. 12, 13 and 14 (courtesy Brown Instrument Co.), the control is set to maintain a constant bath temperature of 113 deg. F. This temperature seems to be generally accepted as optimum under usual chromium plating conditions. Chromium plating was unknown a few years ago. Without mechanical temperature control with instruments chromium plating would be impossible in manufacture even now.

Fig. 12 illustrates the testing of chromium plating vats for temperature before inserting the radiator shields for chromium plating. Fig. 13 shows the operator watching the instruments when inserting the shields into the vat, and Fig. 14 gives an idea of the volume of such work carried out and the beautiful burnished effect of the chromium plating on the shields of the finished product.

Fig. 15 (courtesy of the Foxboro Instrument Co.) shows automatic control of temperature, by instruments, of bath necessary for successful chromium plating, at the plant of a subsidiary of the Chandler Motor Car Co., Cleveland, Ohio. Such careful control of manufacturing processes is only occasionally required in the field of rock products, but when needed it has been all worked out and its kinks straightened at great expense in other industries.

Conclusion

It is self-evident that the automobile industry is a typical representative of the best industrial development of this generation. It profits in all its branches from the modern engineering development of instrumental control through temperature measurement, indicating recording and control devices. In fact high grade production at a rapid rate is only possible because of instrumentation in the most highly developed form.

It is obvious from this that instrumentation is highly advantageous to all modern industry. It should therefore be a sound basis of judgment as to the extent to which instrumentation may profitably be utilized in production of the rock products industry. Specific cases cited from particular branches of the automobile industry where mechanical control is a significant factor in the great strides taken by it, show the advantages to the modern automobile industry derived from instrumentation, and show just what instrumentation actually does. Universal use of instrumentation in the production of automobiles, the advantages to labor in guaranteeing the completion of a high-grade job, to management in guaranteeing performance and establishing confidence in labor, as well as the limitations of instrumentation are matters easily learned from the automobile industry, not only in connection with lacquer manufacture and the finishing of automobiles, but in the seasoning of the lumber, tire manufacture and electroplating. The advantages cannot be measured in terms of dollars and cents only but obviously result in great saving to society as a whole, as well as to industry and the consumer of many many millions in products per year in other industries.

Instrumentation is the only means known to engineering and industry to control variation in product and in production itself. It does this successfully at a great saving over the cost.

(To be continued)

Pompton Gravel Co. in Receivership

VICE-CHANCELLOR Vivian M. Lewis has appointed Bernard L. Stafford, Paterson lawyer, as permanent receiver for the Pompton Sand and Gravel Co., a sister company of the Dyer-Kane Co., of Passaic, N. J., recently adjudged insolvent.

Application for the receivership was made on the petition of Harry Wilkie, Passaic electrical contractor, a creditor.

The Pompton company's major stockholders were Daniel J. O'Leary and the J. J. O'Leary estate, others being Edward Dyer and M. J. Kane.

Vice-Chancellor John O. Bigelow has issued an injunction on this application, restraining the sale of the Pompton company's assets, under foreclosure of mortgage. He contended that a $51,000 mortgage given by the Pompton company in November, 1930, to the Clinton Asphalt Co., was given to secure an obligation of the Dyer-Kane Co.

The Dyer-Kane trap rock quarries at Great Notch were bid in at auction recently by Thomas E. Duffy, of McGuire and Duffy, acting for Mr. O'Leary and others.—*Passaic* (N. J.) *Herald.*

Mining and Crushing Methods and Costs at Limestone Mine of West Penn Cement Co.*

By George A. Morrison
Consulting Engineer, U. S. Bureau of Mines, West Winfield, Penn.

THIS PAPER, describing the methods of mining and crushing limestone at the West Winfield, Penn., limestone mine of the West Penn Cement Co., is one of a series being prepared by the Bureau of Mines on mining practices, methods and costs in the various nonmetallic mining districts.

History

The limestone deposits of western Pennsylvania have been exploited for many years and have been quarried extensively at West Winfield in Winfield township, which lies in the southeastern corner of Butler county.

At first the limestone was burned in open kilns, but later when the demand for furnace stone to flux the iron ores brought into the Pittsburgh district became heavy, the larger sizes of stone were shipped to meet this demand and the smaller sizes were screened out to supply requirements for agricultural limestone and railroad ballast.

As the quarries penetrated farther into the hillsides, the removal of overburden became more and more of a problem, until the cost of its removal made the economic quarrying of the stone prohibitive. Underground methods were then tried. This was about 1892, and mining has been going on continuously ever since.

The early methods of mining were naturally crude, the workings were irregular, and hand labor predominated. Later piston drills operated by gas were used until an explosion occurred which was caused by ignition of the gas. The next step was the utilization of steam for the drills and this was followed by gas-driven air compressors. From this time on progress in mining practice was steady, and present-day operations are along modern lines.

The West Penn Cement Co. was formed about four years ago to manufacture cement from deposits at West Winfield.

Topography and Geology

The whole property lies in rough rolling hills traversed by streams flowing in a southeasterly direction to the Allegheny river. These streams have cut through the strata and exposed successive horizons of economic value. An important uplift with a northeasterly axis crosses the property. Glacial deposits are scattered over the surface of the hills.

A broad brecciated area, averaging some 1500 ft. across and showing a considerable amount of movement and shifting of the beds, crosses the property in a northeasterly direction. This area contains no workable measures and divides the property into a northern and a southern part.

> **Editor's Note**
>
> ***THIS is one of a series of papers by operating men in the rock products industries prepared under the auspices of the U. S. Bureau of Mines.***
>
> ***The present article deals in detail with limestone mining. However, some very interesting and instructive data are given on crushing plant operation, which are of equal interest to commercial crushed-stone operators, because this company makes commercial stone as well as cement raw material.***

The accompanying sketch (Fig. 1) shows the sequence of the strata. All mining operations are in the Carboniferous sedimentaries. The Vanport limestone and the underlying shale and sandstone are being mined while the coal that is uncovered by the removal of the shale is left for extraction at a future date.

The limestone stratum, known as the Vanport, is extensively developed throughout western Pennsylvania. It lies about 65 ft. below the Lower Kittanning coal measures and is recognized by its fossils (mostly crinoids) and certain physical characteristics as being of marine origin.

On the West Penn property this limestone lies nearly horizontal but in reality it forms the top of an anticline with a north and south axis. The limestone averages nearly 25 ft. in thickness on this property and is quite uniform from top to bottom. The only exception to its uniformity is a layer or two near the top which is called the "shell" layer. This layer is denser and more brittle than the underlying stone and often has a layer of shale up to an inch or more in thickness interbedded with it. The bedding planes are well pronounced throughout the deposit and certain layers part well upon blasting. Joint planes and fracture planes run nearly vertical and occasionally break up the stone on shooting, but usually the blasted material is in rather large masses.

The following analysis is typical of this limestone:

	Per cent.
Calcium carbonate	90.00
Magnesium carbonate	1.00
Silica	5.00
Alumina	2.50
Ferric oxide	1.50

The limestone rests upon 14 ft. of shale from which it parts readily when blasted. This shale in turn rests on 3½ ft. of coal (Clarion), which likewise parts readily from the shale.

The shale, which is also mined, is dark gray, of uniform character, and so dense that it must be drilled and blasted for its removal. There are no fossils in this shale, but as it lies between Carboniferous strata—the limestone above and the coal below—it is of that age.

A typical analysis of the shale follows:

	Per cent.
Silica	56.0
Alumina	19.0
Ferric oxide	8.0
Calcium oxide	0.5
Sulphur	3.5
Water	6.8
Volatile	4.0

The Clarion coal which is uncovered by the mining of the shale is a fair grade of soft coal and has the following analysis:

	Per cent.
Volatile	33 to 44
Ash	13 to 6
Sulphur	2 to 1
Fixed carbon	25
B.t.u.	12,600

Lying directly below this coal are from 10 to 16 ft. of fire clay (known as the Clarion). This is used by the Pennsylvania Clay Products Co. and has the following analysis:

	Per cent.
Silica	57.22
Alumina	34.17
Ferric oxide	0.24
Calcium oxide	1.17
Magnesium oxide	0.49
Water	5.82

While probably too high in calcium and magnesium for making fire brick, this clay is desirable for tile, sewer pipe, etc.

Immediately below the fire clay is the Clarion sandstone. This deposit is 50 ft. thick, very uniform in character, and has a high silica content. The following is an average analysis:

	Per cent.
Silica	98.28
Alumina	0.35
Ferric oxide	0.61

*Reprinted from U. S. Bureau of Mines Information Circular 6446.

The only impurities are occasional iron spots and knife-edge seams of interbedded coal.

Overlying the limestone are repeated layers of shale and sandstone, which are of no economic value. Among these impure and weak measures are two coal beds. The lowest of these, the Lower Kittanning, is about 3 ft. thick and may be of value some day.

Exploration

The extensive quarrying of the limestone in the early days proved the uniformity of the Vanport limestone in the western Pennsylvania district. The numerous well-drill holes driven on this property quite completely outlined the deposit on the company's land. The drill holes were primarily for gas and oil, which is found at a depth of some 2000 ft. Many of these wells are producing at present and must be avoided in mining.

Recently holes have been drilled to determine the extent of the brecciated zone already mentioned. These holes, 5½ in. in diameter, are from 100 to 300 ft. in depth and cost 75c to $2 per ft., depending upon accessibility of their location, depth, etc.

In some places the limestone outcrops, but for the most part it is covered with a thick mantle of shale, sandstone and soil.

The uniformity of the stone as to its chemical analysis, physical characteristics and extent simplifies the mining of the deposit.

Sampling

Few mine samples are necessary, but samples are taken hourly and analyzed at the cement plant laboratory and careful check is kept on all ingredients as they are ground into slurry. Slight variations are corrected to maintain the desired analysis of the mix going into the cement.

A considerable amount of the stone mined is sold for commercial purposes. This is marketed on a basis of screen analysis specified by the purchaser. These analyses are made at the mine so the product may be kept up to the specified requirements.

Choice of Mining Methods

The flat-lying strata penetrate from the valley walls into steeply rising hills until the limestone measures often have an overburden of 200 or 300 ft. In the early quarrying the outcropping stone was first worked out. Afterwards stripping was carried on until its cost prohibited further operations by this method.

Then openings were driven into the hills for removing the stone without stripping. Some irregular pillars were left to support the roof. Soon afterwards a single-entry system was adopted, with rooms running off at regular intervals to either side. Later came the installation of the present double-entry system with rooms driven to the left off the left-hand entry and to the right off the right-hand. This system of rooms and entries with ribs left between them for support is the present practice.

The entries and rooms are 30 ft. wide, and 25-ft. pillars are left between. Openings 30 ft. wide are put through the rib pillars every 100 ft. or so.

Two or three layers of stone are left in place in the roof of these rooms and entries to support the weak overburden of shale and sandstone. The thickness of roof layers left for support varies from 3 to 5 ft., depending upon the thickness of the overburden at that point.

The floor of the workings is the top of the shale measures. The height of the workings is determined by a uniform parting layer usually occurring 19 ft. above the floor of the limestone. This height is quite constant, but in a few places in the mine it drops to 10 or 12 ft. The high, wide openings of the underground workings stand up well with little or no timbering.

The accompanying map (Fig. 2) shows a plan of the mine workings in relation to the surface layout.

During the busy season a daily production of 2000 tons of limestone and about 200 tons of shale is maintained. There is no waste, as all of the tonnage broken is either screened and sold to the commercial stone trade or shipped to the cement plant.

Drilling and Blasting

The method of extracting the stone is a breast-stoping system whereby the opening is advanced its full height in one cycle of operations. The width of 30 ft. is taken out in a series of V-cuts driven into the face. The center cut takes out a wedge-shaped piece to a depth of about 8 ft. Then by setting up the drill in the notch formed by the shooting of the V-cut, holes are drilled to meet other sets of holes drilled from the original face along the rib. These are called the "angle cuts" and two of them are required to bring the full room width of 30 ft. for an advance of about 8 ft.

The drill is again set up but this time on the muck pile resulting from the previous blast, and the cycle is repeated again and again, each time from a higher muck pile, until the last set-up is 12 ft. or more above the floor.

The drilling is arranged so that a set of four holes fanned from one set-up will meet four holes from another set-up at right angles. The drill runner lays out the holes by using a powder box as a square and a drill-steel for a straight edge so that he can determine where to start the companion

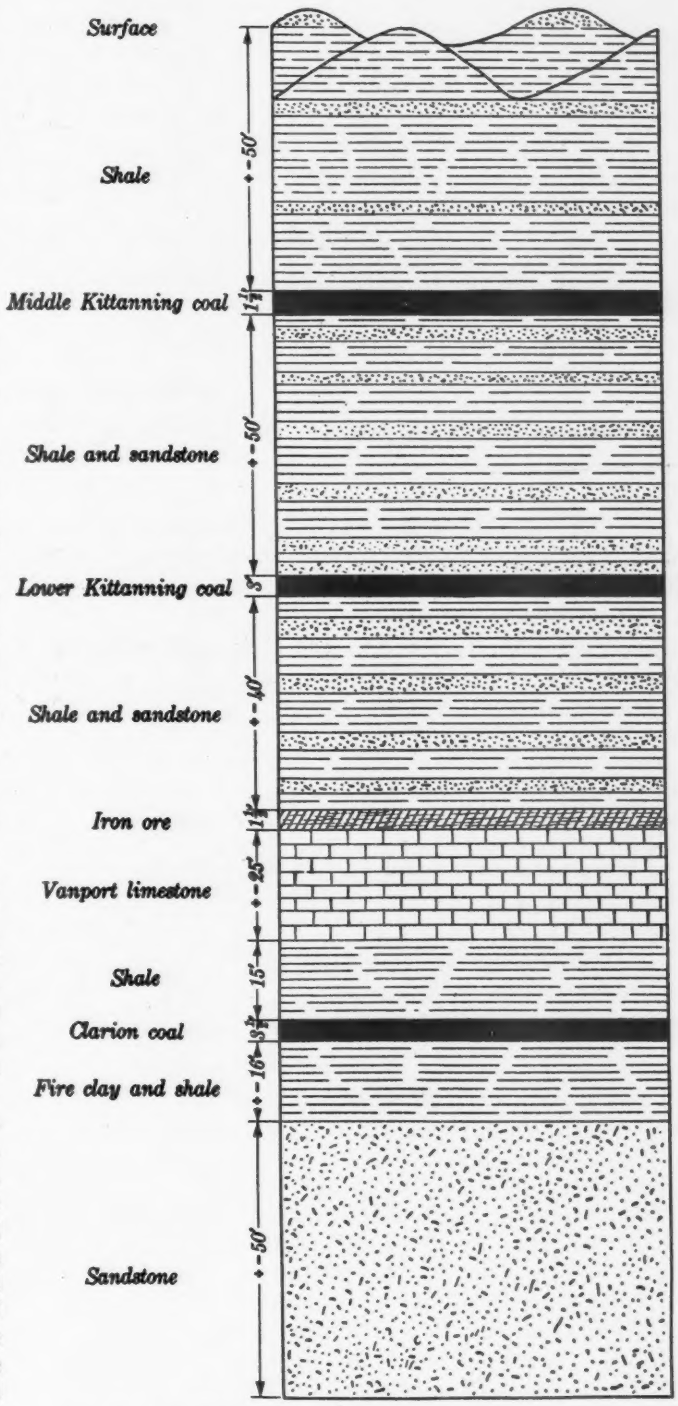


Fig. 1. Vertical section showing relation of rocks at West Winfield, Penn.

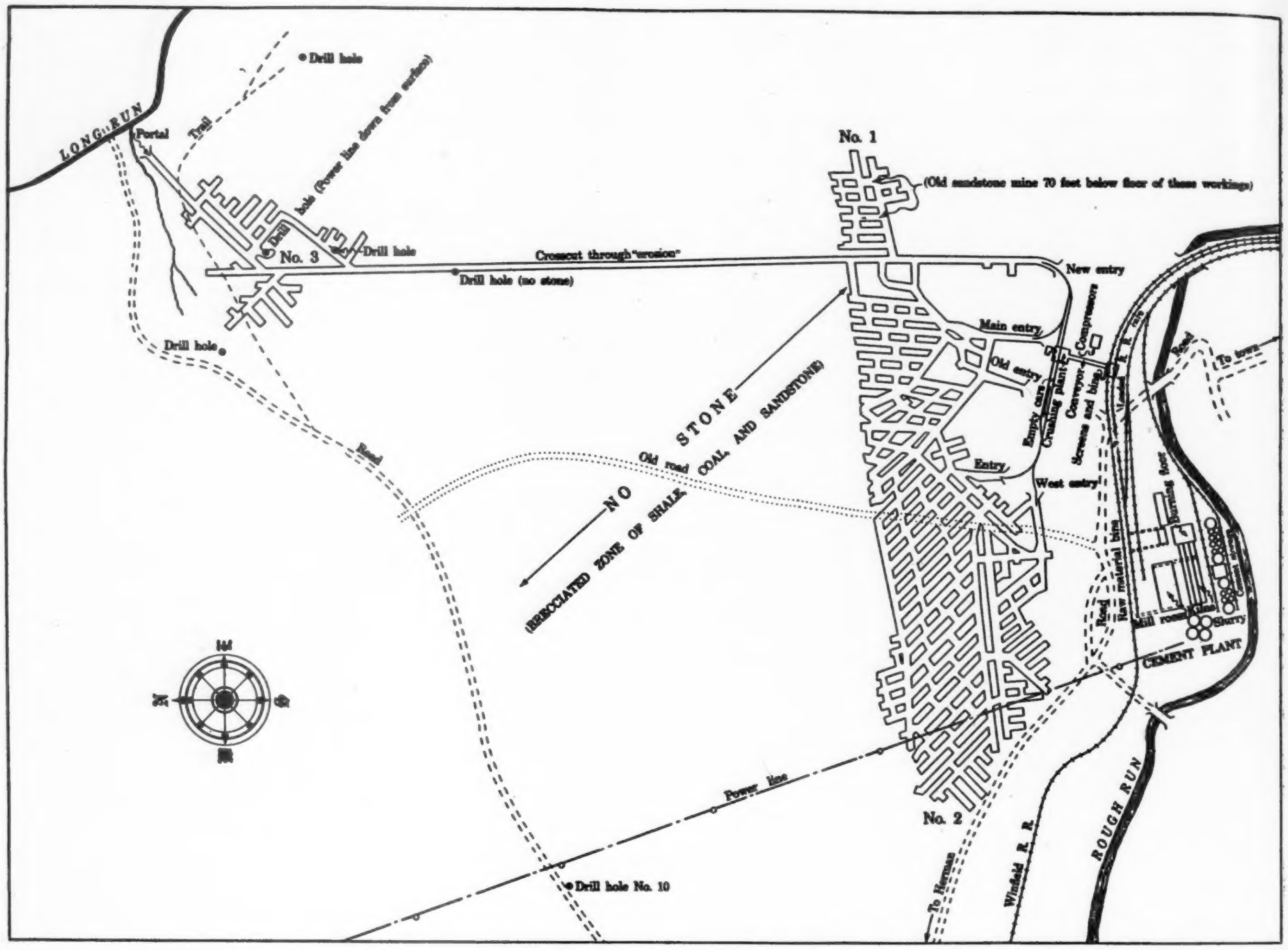


Fig. 2. Plan of mine workings

holes, their angle to the face, and their depth.

The vertical arrangement of holes is also fan shaped and drilled so four holes from one set-up will meet four holes drilled from another set-up. The drilling is done so the top holes come together about a foot below the desired roof and the bottom holes about the same distance above the shale floor. The vertical distance between the apexes of the top holes and those of the bottom holes is 15 ft., and a break 17 ft. high results when the holes are blasted.

The accompanying sketches (Fig. 3) show the drill round in plan and section.

After three or four rounds the face has been advanced about 30 ft. and a stoper drill is set up on top of the broken stone pile to drill 2-ft. vertical holes (Fig. 3) into the roof on 6-ft. centers. These holes are blasted in units of 30 to 36 holes, and the room, then containing about 2000 tons of broken stone, is ready for the power shovel.

In drifting, 3½-in. hammer drills are used mounted on tripods, and all holes are drilled wet. Air at 100 lb. pressure at the compressors delivers about 80 lb. at the drills. Line oilers and a good grade of liquid grease are used on all machines.

The drill steel is 1¼-in. hollow round and is fitted with lugs on shanks. The starter has a 2⅛-in. cross bit of the McLellan type and ⅛-in. decrease in the gage is made on each 30-in. change in the steel length so the bottoming steel (13 ft. 6 in.) has a 1⅝-in. bit.

A machine will average 165 ft. of holes per drill shift, making four set-ups and using from 6 to 9 bits. The drilling speed of the machines is 9 in. per minute, and the steel is actually cutting rock 37% of the time. The balance of the drillers' time is consumed in rigging in and out, changing set-ups and steel, blowing out finished holes and mucking out for set-ups. A helper is used on each machine, as the long steel must be bent to get it into the hole in the narrow V-cut.

The depth of holes varies from 8 to 13 ft., depending upon the condition of the face. All drill holes are loaded by blasters on a night shift and are fired by blasting machines.

A special pulverant dynamite of 35% strength is used in 1½-in. by 8-in. cartridges for all face shots. Another type of dynamite of 37% strength and less mealy is made up in 1¼- by 8-in. cartridges for use in blockholes and stoper work. Little secondary blasting is required, as many face holes are intentionally overloaded so the blasted material is kicked as far back into the room as possible to insure its being filled with broken stone before the shovel is moved in.

All holes are tamped with at least three cartridges of tamping made up by the blasters. No. 6 electric detonators with 8- and 10-ft. copper lead wires are used. Three blasters working on a night shift prepare the tamping, make up their primers and load and shoot all holes. No. 14 insulated copper wire is carried on fixed supports to all faces being worked from locations convenient for the blasting stations. No. 20 annunciating wire is used to connect the main lead wires to the detonator wires.

An average of 0.6 lb. of dynamite is required per ton of stone produced. This includes all secondary shooting and powder used for any other purpose.

Loading the Stone

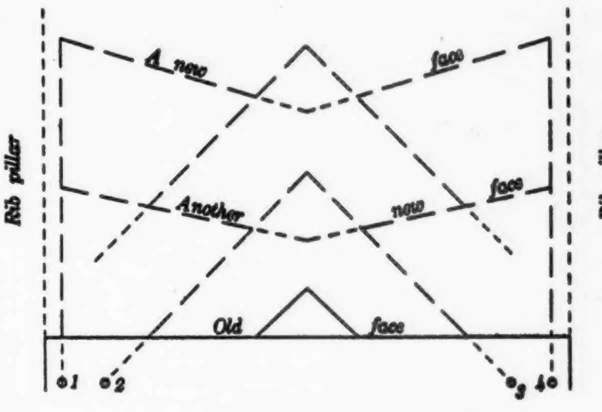
The broken stone is loaded by means of three full-revolving electric shovels which are mounted on caterpillars. These shovels are of ⅝, 1 and 1¼ cu. yd. capacity, re-

spectively. The ⅝-cu. yd. shovel is several years old and inefficient but the other two shovels are of modern design and have proved very efficient. Each of these newer machines is fitted with a 15-ft. boom and a 10-ft. dipper stick. The first two shovels use 250-volt current supplied from the trolley lines, and the last and largest shovel uses alternating current at 440 volts, which is converted to 250 volts (d.c.) by means of a motor generator set mounted on the shovel.

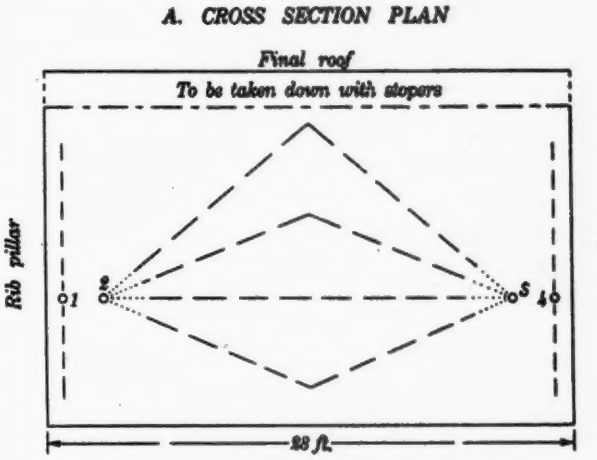
Alternating current at 2300 volts is brought into the mine through a 12-in. drill hole 140 ft. deep. This current is stepped down at the bottom of the hole to 440 volts before being carried in well-insulated triple-conductor cable through the mine to suitable taps for connecting flexible feed wires to the shovel. The largest shovel has proved especially satisfactory and has repeatedly loaded over 1000 tons of stone in a 10-hour shift. In 1930 it averaged 700 tons per shift. An average for the three shovels combined is 1500 tons per shift. The shovels clean up well along the ribs and at the faces. Each is served by a trolley locomotive equipped with a gathering reel and running on double track in each entry and room. These locomotives keep an empty car at the shovel on one track while replacing a loaded car with an empty one on the other track. Enough empty cars are kept in the string at the shovels so, as is often the case, more than one car can be loaded before requiring replacement with empties. When a train of 7 to 12 cars has been loaded it is hauled away to the crusher and an empty train is moved up to the shovel. In the meantime the shovel has from two to four empty cars to load which were left by the locomotive before making its trip.

Table 6 shows the loading data for the first six months of 1930.

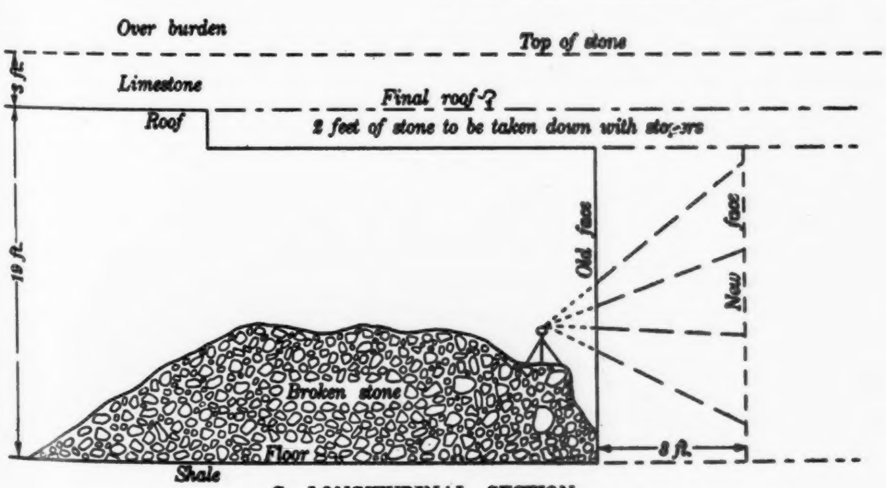
Hand loaders are employed at a contract price of $0.215 per ton to clean up faces and clean out rooms where track is to be laid up to the blasted pile so the power shovels can work on a thick pile of broken stone. At present the hand-loaded tonnage amounts to about 17% of the total tonnage. Later another power shovel will be put to work and much of this hand labor will be eliminated.



A. CROSS SECTION PLAN



B. VERTICAL CROSS SECTION



C. LONGITUDINAL SECTION

Fig. 3. Drill round

A typical shovel crew consists of the following men:

Drillers	2 — 4
Drillers' helpers	2 — 4
Scalers and blasters	2 — 3
Locomotive runners	1 — 2
Locomotive-runners' helpers	1 — 2
Trackmen	2 — 4
Shovel runners	1 — 1
Shovel-runners' helpers	1 — 1
Total	12 — 21

Transportation

Seven-ton trolley locomotives are used, and at present there are four on the property. One locomotive is used for each shovel, and the fourth is used to haul to the crusher from a remote part of the mine. At present the locomotives gathering for two of the shovels also haul to the crusher.

These locomotives have 22-in. wheels with a 4-in. face, a 44-in. wheel base and are 13 ft. long over all. They are powered with two 120-amp., 250-volt motors, are driven by worm-gears, and have a draw-bar pull of 3700 lb. Previously horses were used for gathering but in 1930 their use was entirely discontinued.

The mine cars (Fig. 4) are a solid-body type, dumped by means of a rotary car-dumper, which is actuated by compressed air. These 135 cu. ft. capacity cars have 4-in. axles, with outside journal boxes mounted on 8-in. Hyatt roller bearings and are equipped with four-wheel brakes. The car is 12 ft. long by 6 ft. wide and stands 46 in. above the track. The wheels are 16-in. chilled iron having a face of 4 in. and a wheel base of 38 in. One wheel is tight on each axle. The car bottom is of 3-in. oak plank between ⅜-in. sheet-iron plates. The cars weigh nearly 4 tons each and carry an average load of 8 tons. The couplings are swivel-hitchings of heavy design, so a train can be dumped at the crusher without uncoupling the cars.

Trains of from 8 to 12 cars traverse a circuit so arranged that they are always moving in one direction.

Tracks of 36-in. gage are laid with 40-lb. rails on 5 by 6 in. by 5 ft. oak ties on 2½ ft. centers. Every fourth tie is a steel one of heavy design having fixed gage clamps. Curves are of 70-ft. radius. No. 3 frogs are used in the switches with 5-ft. switch points and 7 to 9 ft. lead rails. The floors are usually smooth and level but occasional rolls occur.

Service tracks to the working faces are of a temporary nature and are made up of 10-, 15-, 20- and 30-ft. sections mounted on light steel ties so they can be removed and carried to another working face or else relaid when required after blasting. Rock ballast is used on all permanent track, and every effort is made to maintain all such track in the best condition.

Parallel throw-switch stands are used to

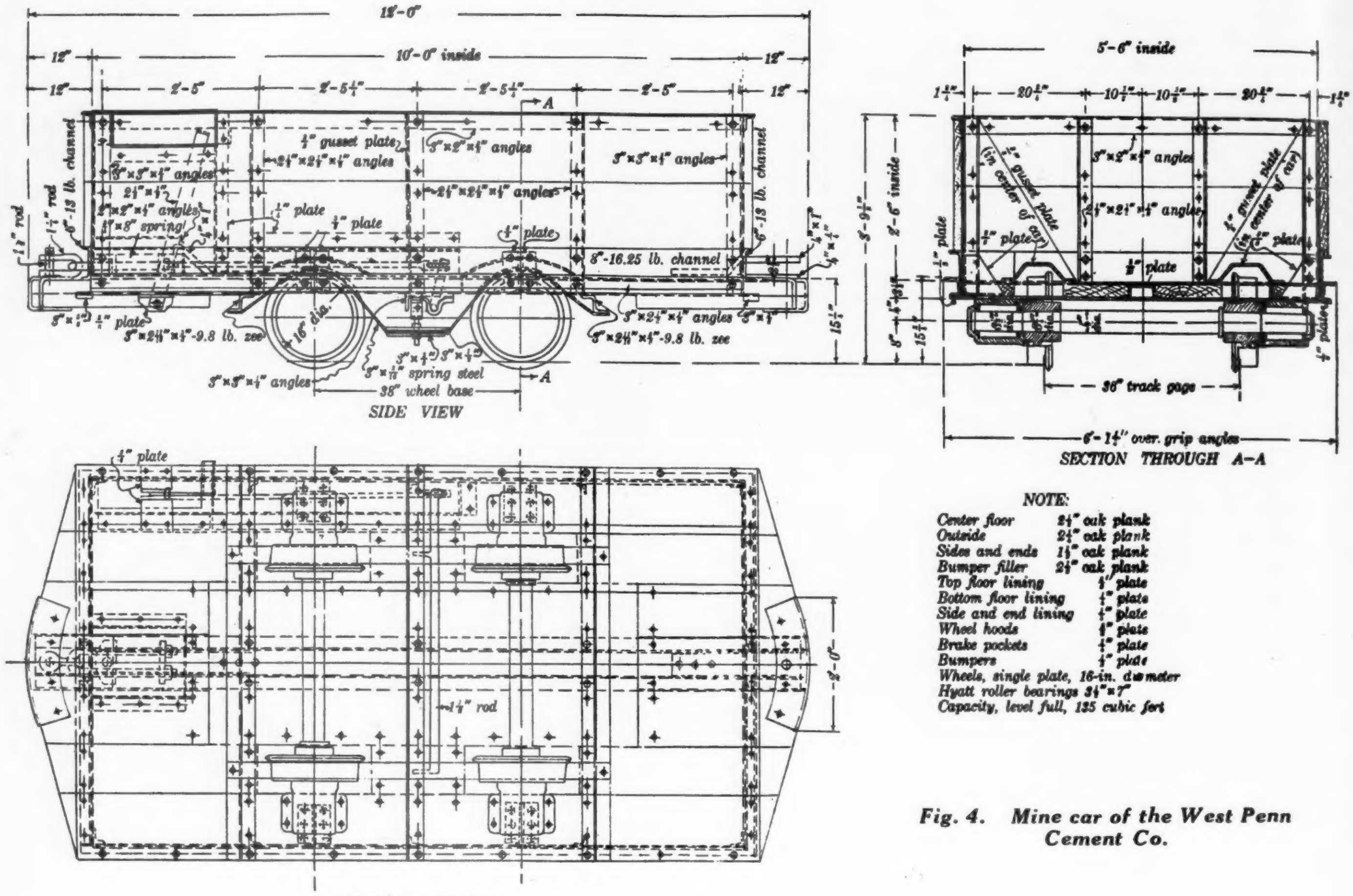


Fig. 4. Mine car of the West Penn Cement Co.

avoid the possibility of the operator being thrown under passing cars when throwing a switch.

In 1930 the average haul (loaded) was about three-quarters of a mile and the 75 cars serving the shovels averaged five trips per shift.

Car repairs at present are mostly due to broken wheels. A new wheel has been designed and its use is expected to reduce this breakage greatly.

The trolley is a "0000" wire suspended 8½ ft. above the track by means of "low-mine" suspension insulators and pipe trusses fastened into the roof by expansion sleeves. By careful bonding and crossbonding a current of 250 volts is maintained throughout the mine.

All power is purchased at 2300 volts and transformed to 250 volts direct current for haulage in the mine by means of a 150-kilowatt motor-generator set of modern design which is in turn served by an automatic switchboard.

Ten to 12 men are engaged in serving the shovels and maintaining track.

Drainage

Little water is encountered, but in certain sections of the mine there is some water at the faces and it is a great hindrance in laying track and in screening the wet stone in the crushing plant. Small pumps operated by air are installed where necessary and moved from place to place as required by conditions at various points in the mine.

Ventilation

All ventilation is natural and is obtained by frequent openings to the surface. These openings are of a large cross section. The constant clearing away of all rubbish and the confining of blasting to one shift contribute to maintaining excellent working conditions.

Timbering

Occasional timbering is required to support certain layers in the roof that may become loose. Ten to 12 in. posts cut from the company's property are used with heavy headboards. At some places in the mine the openings to the surface pierce roof layers so badly leached that they have no strength. In such places drift sets with heavy lagging are required.

Shale Mining

The floor of the limestone is shale, which extends from about 14 ft. to a 42-in. bed of coal. This shale is mined out of rooms from which the stone has been extracted.

To reach this level at the top of the coal a track on a 7-deg. slope is carried down from the old room floor at one place in the mine. The track is thereafter continued on the top of the coal from room to room, going through ribs as they are encountered at points where holes have previously been cut in mining the limestone.

The shale is broken with sinker drills which drill 12-ft. holes on 6-ft. centers in

TABLE 1. CRUSHING PLANT OPERATING DATA, FIRST EIGHT MONTHS OF 1930

Month	Tons	Total hours	Delay in hours due to— No stone	No railroad cars	Big pieces	Miscellaneous	Total
January	33,800	195	16	1	3.5	3	23.5
February	26,400	144	15	0.5	1	4	20.5
March	37,000	200	24	1.5	3	6	34.5
April	23,650	152	32.5	......	3.5	0.5	36.5
May	42,500	250	30.5	......	5	2	37.5
June	51,700	270	25	......	3	3	31
July	48,200	231	32	1	4	5	42
August	51,975	262	40	......	6.5	1.5	48
Total	315,225	1,704	215	4	29.5	25	273.5
Percentage of delays	....	....	78.5	1.5	11	9	100

Percentage of lost time 16
Average number of tons per hr. 186
Average number of tons per hr. (if no lost time) .. 220

NOTE: "No stone" means that the dumper was idle because of no loaded mine cars to dump.

"No railroad cars" means that there was a shortage of these cars.

"Big pieces" indicates that the crusher was plugged or arched over.

Under "Miscellaneous" are included delays for oiling, repairs, or cars with broken wheels.

The tonnage is for stone and shale. The shale is much slower in crushing.

The plant capacity can be assumed to be 250 tons per hour, and the actual production 225 tons.

the old room floors. About 250 tons of shale are required per day and this is broken by two men who do all drilling and blasting and look after the track. The shale loading is all done by hand. The loaders are paid on contract at a rate of $0.215 per ton.

The coal uncovered by mining the shale is left in place for mining at some future date when it may be required. A considerable tonnage of this coal has already been uncovered.

Crushing Plant

CAR-DUMPER—The loaded cars, delivered by locomotives in trains of from 8 to 12, are set on the loaded-car track at the crushing plant. An electrically driven car-puller, consisting of a standard hoist handling a continuous cable through sheaves along this track, hauls the trains in over the car scales and into the car dumper, which is set on a 1½% slope. The cars are completely emptied without being uncoupled by being given a half turn in the dumper cradle, which is revolved by means of compressed air. Two men serve the dumper and also hook the trains and look after the crushers below. The empty cars drift down the empty-car track to be picked up by the locomotive that brought in the loads and which has by-passed the crusher building. The return trip into the mine is on a different track than that over which the loads came out and a circular path of traffic is thereby maintained over which the trains are moving only in one direction.

The dumped stone goes directly into a 30-in. gyratory crusher with its discharge opening set at 4 in. and which is belt driven by a 125-hp. motor. The product from this primary crusher goes over a No. 9 live-roll grizzly with 2¾-in. openings, which is powered by a 10-hp. motor driving through sprockets and chain.

From the grizzly the oversize is lifted by means of a 40-ft. elevator equipped with close-connected steel buckets on double chains to a 10-in. gyratory crusher which is set at a 2-in. discharge opening and is belt-driven by a 40-hp. motor. The discharge from the crusher joins the undersize from the grizzly and is delivered onto a 24-in. conveyor belt 218 ft. long and inclined 3⅛ in. per foot, which conveys the stone to the top of the screen room.

In the screen room is a double-jacketed revolving screen 72 in. in diameter and 26 ft. long, mounted at a slope of 1¼ in. to the foot, over concrete bins. The holes in the revolving screen are round and are punched in ⅜-in. plate. The first jacket is also made of punched plate, but the second one is of woven wire with ⅝-in. holes. All vibrator screens are also of wire screening with square holes. The products of the revolving screen, after the proper blending on vibrating screens, fall into 12 concrete bins which hold about 150 tons each. The bins feed through wide-mouthed gates,

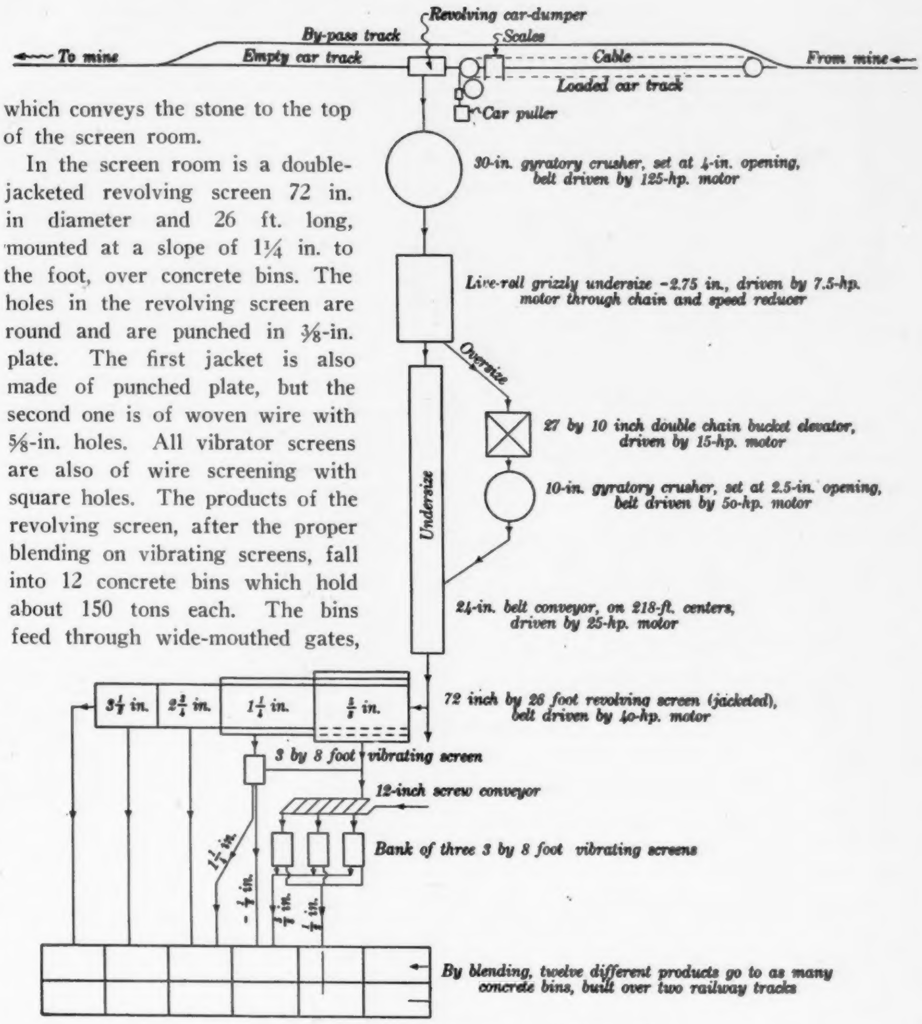


Fig. 5. Flow sheet of crushing plant

TABLE 2. SCREEN ANALYSES

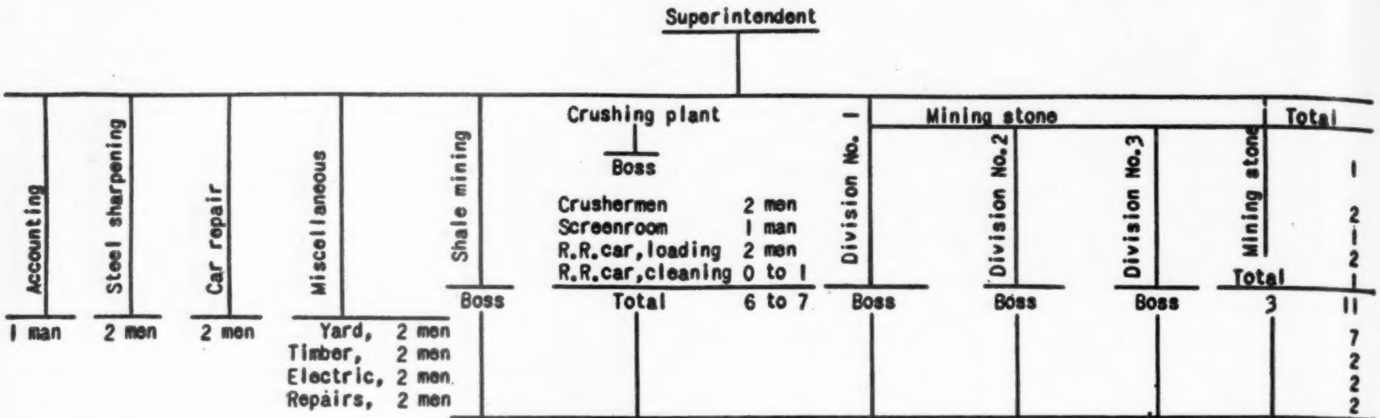
	Primary crusher				Secondary crusher				Main screen		⅝ in. screen	
	Mine run (feed)		Product		Feed		Product		Feed		Feed	
Percentage of total	100		100		35.75		35.75		100		17	
Tons per hour	225		225		80.50		80.50		225		38.25	
	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons
Plus 6-in.	25	56.25	0	....	....	....	......	......	......	....	......	......
Minus 6 plus 3½-in.	15	33.75	*6	13.50	*71.5	57.56	*5.8	4.67	2.0	4.50	......	....
Minus 3½ plus 2¾-in.	19	42.75	32	72.0	17.5	14.09	*33.0	26.57	12.0	27.0	......	....
Minus 2¾ plus 2-in.	12	27.00	14.8	33.3	8.5	6.84	32.1	25.84	25.0	56.25	......	....
Minus 2 plus 1¼-in.	10	22.50	18.0	40.50	1.5	1.21	21.5	17.30	26.0	58.50	......	....
Minus 1¼ plus ⅝-in.	10	22.50	†15.0	33.75	.5	.40	3.8	3.06	18.0	40.50	......	....
Minus ⅝ plus ⅜-in.	2	4.50	3.0	6.75	....	....	1.0	.80	4.0	9.00	21.2	8.10
Minus ⅜ plus ⅛-in.	3	6.75	†5.6	12.60	.25	.20	1.4	1.13	6.5	14.625	38.8	14.85
Minus ⅛-in.	4	9.00	†5.6	12.60	.25	.20	1.4	1.13	6.5	14.625	†40.0	15.30
	100	225	100	225	100	80.5	100	80.5	100	225	100	38.25

*Mostly flat tabular pieces.
†Increase in percentage due mostly to spalling and wearing down in chutes.

TABLE 3. SCREEN ANALYSES OF VARIOUS CRUSHING-PLANT PRODUCTS

Material	Percentage through											
	100-mesh	⅛-in.	¼-in.	⅜-in.	⅝-in.	1-in.	1¼-in.	1½-in.	2-in.	2½-in.	2¾-in.	3½-in.	4-in.
A	10–25	–	–	–	100	–	–	–	–	–	–	–	–
B	–	0–10	0–20	–	100	–	–	–	–	–	–	–	–
C	–	–	–	0–8	10–40	–	95–100	100	–	–	–	–	–
D	–	–	–	0–10	0–50	95–100	100	–	–	–	–	–	–
E	–	–	–	0–8	5–20	–	30–65	–	–	95–100	100	–	–
F	–	–	–	–	–	–	0–15	–	30–65	95–100	100	–	–
G	–	–	–	–	–	–	0–10	–	–	25–50	–	90–100	100
H	–	–	–	0–8	0–30	–	95–100	100	–	–	–	–	–
I	–	–	–	0–8	0–15	–	30–65	–	–	95–100	100	–	–
J	–	–	–	–	–	–	0–15	–	–	30–65	–	95–100	100
K	–	0–3	0–10	25–40	Pass ½-in.	–	–	–	–	–	–	–	–
				25–40	Pass ¾-in.	25–40	90–100	100	–	–	–	–	–
L	–	–	–	0–8	0–15	–	30–65	–	–	95–100	100	–	–
M	8–12	–	–	–	95–100	–	–	–	–	–	–	–	–
N	–	–	0–5	–	0–25	–	–	75–95	100	–	–	–	–
O	–	–	–	0–8	0–15	–	30–65	–	95–100	100	–	–	–
P	–	–	95–100	100	–	–	–	–	–	–	–	–	–

Note: These products are not made at the same time, but the plant may be called upon at any time to make a number of them. They are made by blending in chutes and bins, so that the proper mixture goes into the railroad cars.



Shale mining		Division No. 1	Division No. 2	Division No. 3	Mining stone Total	Total
–	Stoper drillers	–	1	1	2	2
2	Drillers	2	3	5	10	12
–	Drill helpers	2	3	5	10	10
–	Blockholers	1	1	3	5	5
–	Scalers	1	2	3	6	6
–	Blasters	1	1	1	3	3
–	Shovelmen (power)	2	2	2	6	6
–	Trackmen	2	4	4	10	10
1	Locomotive runners	1	1	1	3	4
1	Locomotive brakemen	1	1	1	3	4
10	Loaders (hand)	3	3	4	10	20
–	Miscellaneous	–	1	1	2	2
15	Total mining	17	24	32	73	88
	Total outside (additional)	(Mine bosses included in total mining)				20
	Grand total					108

Fig. 6. Organization chart

operated by hand, into railway cars standing on the double railway tracks immediately beneath.

The delivery of the product carried by the conveyor from the crushers is arranged so that, by means of chutes and gates, stone for the cement plant can be delivered directly to bins without having to go through the revolving screen. The screened products are blended as required by the specifications of the trade for road material and concrete aggregate.

An 18-in. apron conveyor traverses one side of the bins and elevates material from any bin to a mechanically-vibrated screen which is drenched with water from numerous nozzles under high pressure. This washed material is drained while passing through metal spouts into the railway cars below.

Finished stone for the cement plant is delivered in hopper-bottomed railroad cars which are drawn into the unloading-tunnels at the plant, or else have their loads stocked in convenient piles to be reclaimed by locomotive cranes as required.

Truck haulage from all bins is provided by conveniently operated chutes. Fig. 5 is a flow sheet of the plant.

Table 1 gives a summary of crushing data for the first eight months of 1930.

In the three years this plant has operated, no renewals have been required by the crushers (except for some bottom plates in the 30-in. gyratory), conveyor or revolving screen. Chutes have had to be relined and patched, however. The screens on the vibrators last about six months, and the drive belts on them are likely to whip out at the fastenings in a few months.

The flow sheet (Fig. 5) shows that the undersize through the ⅝-in. revolving screen passes to a bank of three vibrating screens. A smaller number of vibrators might do the work, but it was considered possible that ⅛-in. screens might be used on them, and as the stone from the mine is often damp, it is necessary to carry a thin bed on these machines to insure proper sizing.

Table 2 shows screen analyses of the various products.

The crushing plant is operated primarily to supply the cement plant with raw material and the screening plant to supply surplus

TABLE 4. DRILLING DATA, JANUARY 1 TO DECEMBER 1, 1929

Periods by quarters	First	Second	Third	Fourth	Total
Drill shifts (drifters only)	207	525	607	266	1,606
Feet of drilling (drifters only)	29,874	84,823	102,000	42,526	259,220
Average feet drilled per drill shift	145	161	168	160	160
Steel used (total number)	1,315	4,584	5,609	2,420	13,928
Steel used per drill shift (average number)	6.3	8.8	9.5	9	8.7
Per cent. of steel broken	5.3	6.0	7.5	4.7	6.3

Total shifts, all drills	*2,283
Total repairs, all drills (including tanks, tripods, etc.)	$2,107
Repairs per drill shift	$0.92
Tons produced	388,285
Feet drilled per ton	0.67
Tons per drill shift (1606 plus stoper 425 equals 2031 shifts)	190
Steel-sharpener shifts	250
Steel-sharpener shifts per drill shift	0.11
Steel used per drill shift (average number)	8.7
Steel produced per sharpener shift	55
Repairs per sharpener shift	$0.60
Drill repairs per ton produced, 1929	$0.0054
Drill repairs per ton produced, 1928	.0053

*This figure includes 252 drill shifts employed in block-holing or secondary drilling.

Note: The steel in 1¼- and ⅞-in. sizes contained 0.87% carbon. Fifty per cent. of the breakage is in the ⅞-in. steel used in stoper machines.

TABLE 5. TRANSPORTATION DATA, JANUARY 1 TO JULY 1, 1930

Tons hauled, stone and shale	212,116	Average length of haul, feet (loaded)	2,359
Tons hauled (including double haul in gathering)	292,100	Ton-miles hauled	130,500

	Per cent	Per ton produced	Per ton double-hauled	Per ton-mile
Locomotives:				
Operating labor		$0.027	$0.0196	$0.0438
Repair labor		.004	.0038	.0062
Operating supplies		.001	.0007	.0015
Repair supplies		.003	.0025	.0055
Power		.003	.0021	.0047
Total locomotives	34	.038	.0287	.0617
Trolley:				
Labor		.004	.0032	.0071
Supplies		.002	.0016	.0035
Total trolley	5	.006	.0048	.0106
Cars:				
Labor		.005	.0038	.0085
Supplies		.006	.0041	.0092
Total cars	10	.011	.0079	.0177
Track:				
Labor		.038	.0275	.0609
Supplies		.015	.0111	.0247
Total track	48	.053	.0386	.0856
Livestock: Labor and supplies	3	.004	.0032	.0068
Total transportation	100	.112	.0832	.1824

Note: The average tons per trip to the crusher is 64. Gathering requires many trips of but small tonnage; making up trains and placing empties. The average car load is 8 tons.

TABLE 6. POWER SHOVEL DATA, JANUARY 1 TO JULY 1, 1930

Shovel number	No. 1		No. 2		No. 3		Totals and averages	
Total tons loaded	61,000		72,500		26,700		160,200	
Tons loaded daily (10 hr.)	555		702		342		550	
Tons loaded per car	7.75		7.73		8.15		7.80	
Percentage of time operating	84		85		74		83	
Percentage of lost time	16		15		26		17	
Loading cost in dollars per ton:								
Operating labor	0.028		0.028		0.047		0.037	
Repair labor	.005		.006		.014		.007	
Operating supplies	.002		......		......		.001	
Repair supplies	.008		.007		.015		.008	
Power	.004		.003		.006		.004	
Total cost	.048		.044		.082		.052	
Operating data: Delays due to—	Per cent.	Minutes per shift	Per cent.	Minutes per shift	Per cent.	Minutes per shift	Per cent.	Minutes per shift
Mechanical trouble	11	25	20	24	30	59	19	31
Electrical trouble	15		7		8		10	
Moving shovel	11	11	20	18	16	25	17	17
Track-laying, etc.	26		20		9		21	
No empties	12		16		20		15	
Locomotives	5	60	4	48	2	72	4	54
Wrecks	12		8		10		10	
Bench (hard digging)	8		1		5		4	
Total delays	100	96	100	90	100	156	100	102
Maximum hourly production (tons)	75		105		45		79	
Average hourly production (tons)	55.5		70.2		34.2		55	
Efficiency:								
Average divided by maximum, %	74½		67		76		70	

Note: All shovels are electric, full-revolving and served in the same manner. No 1 shovel is of 1 cu. yd. dipper capacity. No. 2 shovel is of 1¼ cu. yd. dipper capacity. No. 3 shovel is of ⅝ cu. yd. dipper capacity.

production to the commercial stone trade. The requirements as to size of commercial stone vary and the tonnage demand is also erratic. No anticipation of the sizes and tonnage required can be made definitely. Since space for stockpiling is limited around the plant and the demand for the products fluctuates, it is often necessary to put the whole daily production over the screens to produce the required tonnage of some certain size or sizes.

Table 3 lists some of the products sold and their specifications. By means of spouting between screens and bins, mixtures are made so many combinations can be turned out for shipment.

Per Cent. Extraction—Two-Thirds of Output for Cement

As there is no concentration, the crushing plant delivers the same tonnage it receives from the mine.

TABLE 7. SUMMARY OF COSTS IN UNITS OF LABOR, POWER AND SUPPLIES

	Mining			Crushing			Other			Total		
	Stone	Shale	Stone and shale	Stone	Shale	Stone and shale	Stone	Shale	Stone and shale	Stone	Shale	Stone and shale
A. Labor (man-hr. per ton):												
Drilling	0.119	0.051	0.111	......	......	......	0.012	0.008	0.012	0.131	0.059	0.123
Blasting	0.017	0.010	0.016	......	......	......	......	......	......	0.017	0.010	0.016
Scaling	0.032	0.020	0.031	......	......	......	0.006	0.003	0.005	0.038	0.023	0.036
Loading:												
(A) Shovels	0.031	......	0.027	......	......	......	0.005	......	0.004	0.036	......	0.031
(B) Hand	0.075	0.329	0.105	......	......	......	......	......	......	0.075	0.329	0.103
Hauling:												
(A) Direct	0.049	0.050	0.050	......	......	......	0.032	0.033	0.032	0.082	0.082	0.083
(B) Track	0.062	0.036	0.058	......	......	......	......	......	......	0.062	0.036	0.058
Miscellaneous	......	......	......	......	......	......	0.025	0.025	0.025	0.025	0.025	0.025
Superintendent	0.023	0.024	0.023	......	......	......	......	......	......	0.023	0.024	0.023
Crushing	......	......	......	0.032	0.044	0.033	......	......	......	0.032	0.044	0.033
Total labor	0.408	0.520	0.421	0.032	0.044	0.033	0.080	0.069	0.078	0.520	0.633	0.532
Average tons per man-shift	24.3	19.3	23.8	310	227	304	125	144	129	19.2	15.8	18.7
Labor, per cent. of total	......	......	......	......	......	......	......	......	......	47.5	72.5	49.6
B. Power and supplies:												
Explosives (lb. per ton)	......	......	......	......	......	......	......	......	......	.685	.466	.655
Total power (kw.h. per ton)	......	......	......	......	......	......	......	......	......	......	......	2.17
Shovels	......	......	0.41	......	......	......	......	......	......	......	......	.41
Locomotives	......	....	0.70	......	......	......	......	......	......	......	......	.70
Compressors	......	......	0.39	......	......	......	......	......	......	......	......	.39
Dump	......	......	......	......	......	0.02	......	......	......	......	......	.02
Crushers	......	......	......	......	......	0.52	......	......	......	......	......	.52
Screens	......	......	......	......	......	0.06	......	......	......	......	......	.06
Elevators	......	......	......	......	......	0.02	......	......	......	......	......	.02
Conveyors	......	......	......	......	......	0.04	......	......	......	......	......	.04
Washing	......	......	......	......	......	0.01	......	......	......	......	......	.01
Other supplies, per cent. of total	......	......	......	......	......	......	......	......	......	......	......	10.7
Supplies and power, per cent. of total	......	......	......	......	......	......	......	......	......	......	......	14.1
Per cent. of total cost	......	......	......	......	......	......	......	......	......	......	......	78.5

TABLE 8. DETAILED SUMMARY OF COST, JANUARY 1 TO JULY 1, 1930

	Stone		Shale		Stone and shale	
	Per cent.	Cost per ton	Per cent.	Cost per ton	Per cent.	Cost per ton
Loading:						
Total all shovels	......	$0.045	......	......	......	$0.039
Total all hand-loading	......	.045	......	$0.215	......	.075
Total loading	15.3	.090	36.3	.215	17.5	.104
Drilling:						
Operating labor	......	.098	......	.064	......	.095
Air	......	.010	......	.010	......	.010
Operating supplies	......	.011	......	.012	......	.012
Repair supplies	......	.006	......	.006	......	.006
Total drilling	21.3	.125	15.5	.092	20.6	.122
Blasting:						
Labor	......	.013	......	.007	......	.010
Explosives and other supplies	......	.095	......	.063	......	.092
Total blasting	18.3	.108	11.8	.070	17.2	.102
Haulage:						
Locomotives	......	.043	......	.043	......	.043
Trolley	......	.006	......	.006	......	.006
Cars	......	.011	......	.011	......	0.11
Track maintenance	......	.053	......	.063	......	.054
Total haulage	19.1	.113	20.9	.123	19.1	.114
General charges	26.1	.154	15.5	.092	25.6	.151
Grand total	100	.590	100	.592	100	.593

The mining recovery at present is 55%. The remaining 45% can be recovered later by removing pillars on a retreating system from many places where the surface is of so little value that subsidence is not objectionable.

The cement plant consumes two-thirds of the mine output and the balance is sold to the trade as commercial stone.

Employes' Pay System—Mostly on Hourly Basis

The mine is operated on a six-day week basis of 8 or 10 hours daily, depending upon the tonnage required. Due to a fluctuating market, the working season varies somewhat, but 10 months is about the average year.

Except for about 18% of the total, all labor is paid on an hourly basis, and wages vary from 45 to 80c per hour. The shale and some of the stone is loaded by hand on

contract at a rate of $0.215 per ton, and it is this labor that accounts for the 18% exception noted above.

Safety Methods, Etc.

Well-equipped first-aid cabinets are kept at various places throughout the mine and crushing plant. Each locomotive and shovel also carries a kit.

The mine is divided into three divisions, each under a separate boss. These divisions compete with each other for quantity of production and the least number of accidents.

Three first-aid teams are kept in training, one team for each division of the mine.

In 1929 the whole force was given a course in first-aid under the direction of a representative of the Bureau of Mines.

Careful scaling of the roofs, well-planned preparation for shots, adequate lighting of workings, cleaning up openings and keeping passageways free from stone, etc., maintaining equipment in the best repair and efficient workmen who think of the possibilities of an accident as well as efficiencies all aid in maintaining low accident rate.

Efficiencies and Costs

Tables 4, 5, 6, 7 and 8 give various statistics of performance. Fig. 6 is an organization chart.

Annual Conference of the Institute of Quarrying

THE PROGRAM for the 13th annual conference of the Institute of Quarrying to be held at Torquay, England, has been announced. Papers of especial interest to be read are "Snags in the Stone Trade from a Road Engineer's Viewpoint," "Limestones," "The Dry Cleaning of Gravel and Stone," "Sand," "Testing and Specifications of Sandstones" and Economics of Quarrying." The conference is to be held July 6 to 9.

Diamond Core Drill Fittings Standards

THE REPORT of a survey undertaken by the Bureau of Standards, U. S. Department of Commerce, to determine the results obtained from the standards established for diamond core drill fittings indicates that benefits are anticipated. The feeling seems to be that insufficient time has elapsed to definitely measure benefits which result from these standards. Consequently the existing standard has been reaffirmed for another year beginning January 1, 1931.

Although certain tolerances specified in the commercial standard have been modified to improve manufacturing conditions, there has been no change in nominal dimensions or in the general plan to obtain interchangeability, and the majority believe it inadvisable to revise the standard at the present time, since the new tolerances have not been subjected to adequate trial in actual practice.

Standards Yearbook—1931

THE 1931 STANDARDS YEARBOOK as compiled by the National Bureau of Standards, George K. Burgess, director, has been issued by the Department of Commerce. It is the current resumé of the standardization movement in many fields of industry conducted by national and international agencies.

The present volume contains outlines of the standardization activities and accomplishments of the bureau and other agencies of the federal, state, county and municipal governments; also those of technical and trade associations. Included in this issue is an outline of such methods as are employed by these agencies for making their standards and specifications effective throughout industry and determining if these requirements are being complied with.

The Standards Yearbook is proving of great interest and value to industrial experts, engineers, manufacturers and research men. The average man, though he may be familiar with the specifications and work of the bureau, is not aware of the truly gigantic volume of work that is being carried on. The correlation of our own and international agencies of this kind is remarkable. The extent and ramification of the detail involved in this movement, the result of work accomplished and the status of work in progress, as well as the co-operation of the manufacturing nations of the world is notable.

Activities of the bureau cover most industries. Their broad scope may be visualized by the fact that the list of headings of divisions of their activities fills more than three pages of solid type. Owing to the tremendous scope of these activities the Yearbook of necessity is a condensed outline rather than a detailed report. Many of the activities pertain directly to the rock products industry. The outline form makes it possible to quickly review related work and to determine its significance.

The following list tabulates work of special interest to the rock products industry: Bureau of Public Roads standardization of specifications of various road surfacing materials; Bureau of Mines work with the safety code correlating committee; investigation of the durability of concrete aggregates, investigation of concrete masonry units, of clays as admixtures in concrete, tests of the Arlington Memorial bridge, reaction of water on calcium aluminate cements, cast stone, diatomaceous silica and waterproofing compounds; standard classification of feldspar; investigation of soundness of hydrated lime and particle size distribution and specifications for chemical lime; properties of gypsum fiber concrete and how to render gypsum products weatherproof; the properties of sand-lime brick; oiliness of lubricating oils and oil recommendations; safety code investigations and recommendations, and publication of "Standards and Specifications" for nonmetallic minerals and their products.

Practical application of information developed through study and research is attained through co-operation with various governmental and trade associations.

Magnesite in 1930

THE TOTAL QUANTITY of crude magnesite mined in the United States in 1930 was 129,320 short tons, with an approximate value of $1,033,130, according to reports furnished by producers to the United States Bureau of Mines, Department of Commerce. This represents a decrease of 31% from the quantity mined in 1929 (187,660 short tons).

Magnesite was mined and sold in California in 1930 by the Sampson Magnesite Co. (803 Balfour Building, San Francisco, Calif.) near Tres Pinos, San Benito County; Maltby Magnesite Co., Ltd., (1308 Humboldt Bank Building, San Francisco, Calif.) near Livermore, in Canta Clara County; California Magnesite Co. (1 Montgomery St., San Francisco, Calif.) at Patterson, Stanislaus County; and the Sierra Magnesite Co., Ltd. (111 Sutter St., San Francisco, Calif.), working its newly acquired Bald Eagle mines in Stanislaus County in addition to its mines near Porterville, Tulare County. The Northwest Magnesite Co. (executive offices, Farmers Bank Building, Pittsburgh, Penn.), Chewelah, Wash., was the only producer in Washington in 1930.

Sales of magnesite of domestic origin in 1930 were 8,580 short tons of caustic calcined, valued at $260,010, a decrease of 24.6% in quantity and 35.8% in value as compared with 1929; and 49,460 short tons of dead-burned, valued at $903,450, a decrease of 37.1% in quantity and 41.4% in value as compared with 1929. No crude magnesite was sold in 1929, but in 1930, 1,120 short tons valued at $14,410 was reported sold.

Prices, as quoted in trade journals, were the same as in 1929. Throughout the year caustic calcined magnesite (80% through 200-mesh) was quoted at $40-43 per short ton and crude at $11 per short ton, f.o.b. California mines. Dead-burned magnesite was quoted at $29 per short ton f.o.b. California mines and $22 f.o.b. Chewelah, Wash. Producers of caustic calcined magnesite reported actual sales of high-grade material as high as $40 per ton, but much of it was sold as low as $28 per ton, f.o.b. California mines. For ordinary dead-burned magnesite the prices reported by California producers ranged from $24 to $33; $60 a ton was paid for special high-grade material.

Imports in 1930, according to the Bureau of Foreign and Domestic Commerce, were 856 short tons of crude magnesite valued at $9,061; 3,403 short tons caustic calcined valued at $78,107; and 46,936 tons of dead-burned valued at $702,456.

The Sand and Gravel Industry and Its Problems

Part IV—Screening Practice and Scrubbing—With a Suggested Design for a Scrubber

By John Zollinger
Oakhurst, N. J.

IN THE preceding Part III (March 28, 1931, issue), I touched slightly upon the screening problems in connection with producing close separations.

The writer recently visited a large dredging outfit with the screening plant on board the dredge. Flat vibrating screens of the three-deck type were used. These screens were placed three abreast and the discharge from an 18-in. pump spread over them.

This to me does not seem like good practice. A multiple-deck screen has only two things in its favor, namely, the first cost and the saving of headroom. The disadvantages, in my opinion, more than offset these good points.

The constant load on two or three decks makes heavy and cumbersome construction necessary; then the smallest opening screen, and consequently the quickest wearing, is at the bottom, making the removal of the top screens necessary to change the bottom. Since the coarse separation is made on the top screen, the lowest screen is more apt to blind, since there is no coarse aggregate to help drive the close mesh stuff through.

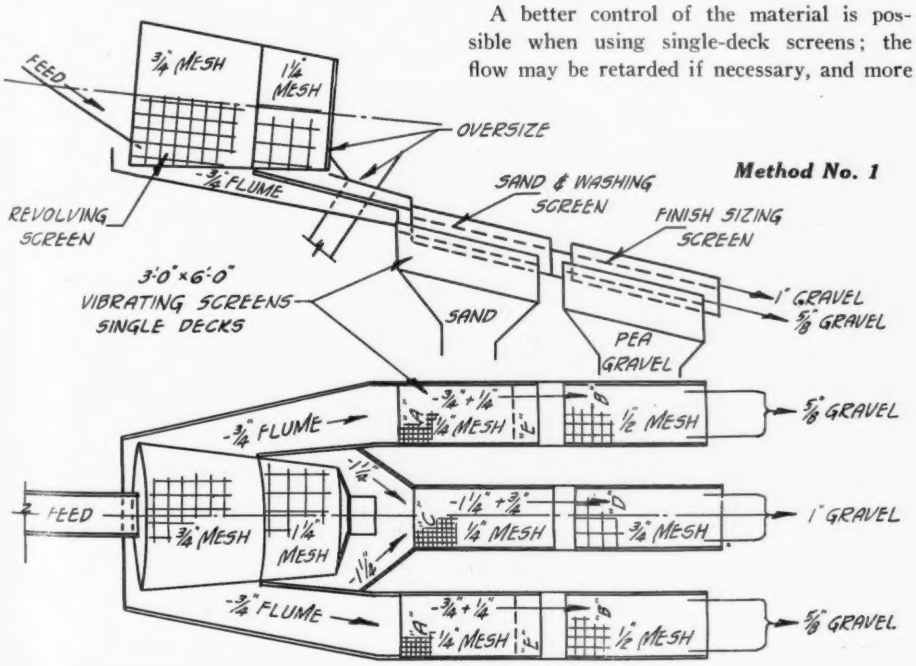
These points were brought home more forcefully at the visit aforementioned. It happened that the lowest screens were worn in places, and it certainly was a busy time for five or six men to dismantle the three screens and put in new sections. On top of that, the second deck showed some slight wear, and rather than go through the same procedure again in a short while, these screens were changed also, thereby losing the benefit of a part of the life of valuable screen cloth.

Editor's Note

THE EDITOR realizes that the subject matter here is controversial; it could hardly be otherwise since our author specifically recommends a particular screening practice. His recommendation and criticisms, however, are based on genuine operating experience and have the merit of being specific, whether accepted by other operators or not.

The editor presumes there are operators whose experience has been different and whose opinions may be at odds with our author. In such a case it is only necessary to remind them that these columns are open for a general discussion of screening practice, or any other phase of plant operation, on which they wish to take issue with Mr. Zollinger.—The Editor.

A better control of the material is possible when using single-deck screens; the flow may be retarded if necessary, and more evenly distributed over the entire surface; also the washing will be more satisfactory and a cleaner product obtained.



Method No. 1

Vibrating Screen Practice

I have found it necessary to support vibrating screens of the positive type rigidly, rather than have them hung on cables or otherwise suspended. Since a screen is balanced with a certain load and may run perfectly under that condition, with the variation of load a certain amount of vibration is taken up by the frame. This condition causes the frame to vibrate, and naturally imparts such vibrations to whatever support is used. If cables, they will cut through, and if rods or chains they will wear very rapidly at the joints. Therefore a heavily constructed frame, well supported, will give most satisfactory service. The writer has built several large screens of the positive eccentric type, and experiments under actual operating conditions have brought out the following:

(1) Use single-deck screens, with some quick arrangement for changing screens.

(2) Heavy roller bearings with forced lubrication.

(3) Heavy side frames fastened to sills rather than cables.

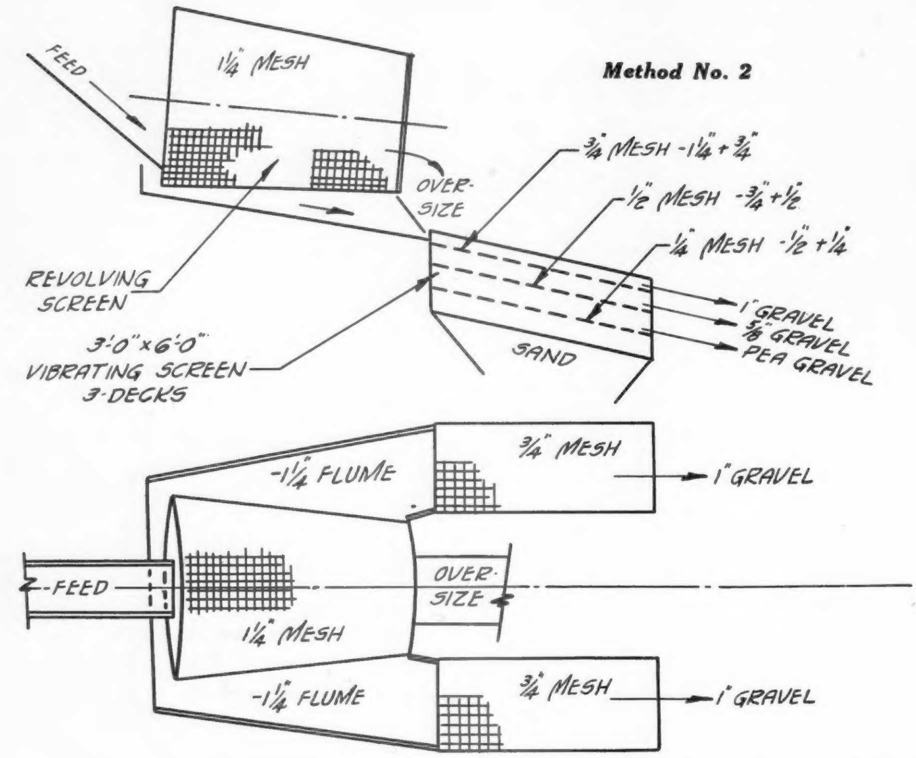
(4) Do not overload.

Selection of Wire Cloth

The selection of the proper screen cloth and area required depends on several factors. First, the tonnage of finished material desired, the composition of the raw material, whether dry screened or washed through, and the type of screen used.

Should we have the problem of producing 200 tons per hour of washed sand and gravel, from the Raw Material Chart illustrated in the March 28 issue of ROCK PRODUCTS, page 56, the first step naturally would be to determine the composition of the bank run, by sieve tests, to find how much material has to be handled at each separation. Such a screen test, however, has practically no relation to the actual requirements of production screen equipment.

This seems a silly statement, but the point I want to bring out is that a hand sieve test may show a deposit to be ideally constituted of the various grades, but should we pro-



Method No. 2

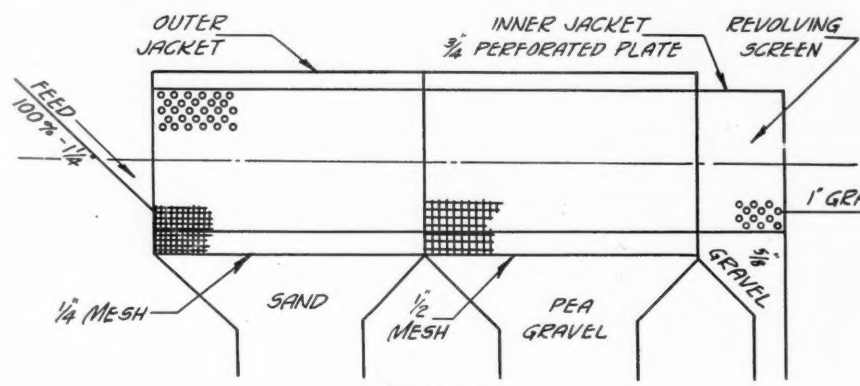
ceed to install screens, all separations with the same screening area, an entirely different result would be obtained.

There is no formula to consult and only actual experience and relative data acquired will enable anyone to figure the screening area required and the proper equipment to be used intelligently. There are, of course, deposits which are very simple to handle and constitute no problem at all, but the elements have not been so kind in all sections of the country. Sand and gravel deposits were formed with utter disregard for the "1931 specifications."

Methods of Screening

Three distinct methods of screening might be employed, each having its advantages, each working perfectly in one layout, and still proving a failure in another.

METHOD No. 1. To make a preliminary separation with a revolving screen, say down to ¾ in., then to make the sand separation first using the comparatively heavy aggregate to force the near size particles through, and make subsequent separations after the sand is taken out. The sand screens—*A*—may have to be sectioned if part of the near ¼-in. size has to be removed entirely. Screen —*B*—may have to be sectioned if there is an overburden of pea gravel.



Method No. 3

METHOD No. 2. Appears to be a very simple operation and an eloquent salesman will have no trouble in convincing a credulous board of directors of its efficiency and practicability. We also admit that in a good many places such an installation will work, but let us confine ourselves to the problem we set out to solve.

METHOD No. 3. Consists entirely of revolving screens. The oversize is taken out before the feed enters the screen as in Method No. 2. The inner jacket is perforated plate and the minus ¾ in. will help to keep the sand jacket from blinding.

Now, having the three different methods to choose from, the next step will be to determine the screening area and the screens to be used and the method most practicable and efficient.

Key to Screening

The key or determining factor to any screening problem is the point of division between sand and gravel. Consulting our chart (March 28 issue), we find that 54.35% of the raw material consists of sand. We also find that 24.74% of this sand constitutes material retained on a 10-mesh screen. According to our sand specifications, we find that only a maximum of 20% of this is permissible in the finished product. Consequently some of this material will have to be removed. Again referring to the chart, we find that 48.6% of the gravel consists of minus ½-in. material retained on a ¼-in. screen; all of which indicates that a lot of screening area is required to make this split, since a very large proportion of the bank is small material and a large amount of this small material will be near mesh size. Setting this information down it would look as in Fig. "A."

Now 108.7 tons per hour will have to pass through a ¼-in. screen; 44.7 tons through a ½-in. screen. Owing to the great amount of grit and near ¼-in. size material, a revolving screen does not seem the ideal machine, since the blinding would be severe; also, a very large and heavy screen would be necessary. So rather reluctantly we figure Method No. 3 impracticable. Considering Method No. 2, we find, by taking out the large sizes first, the sand separation will be very hard to make, having no heavy material to aid in passing the near mesh material through. Also the bottom screen on a three-deck machine does not get the full benefit of its area, and in this case a lot of screen-

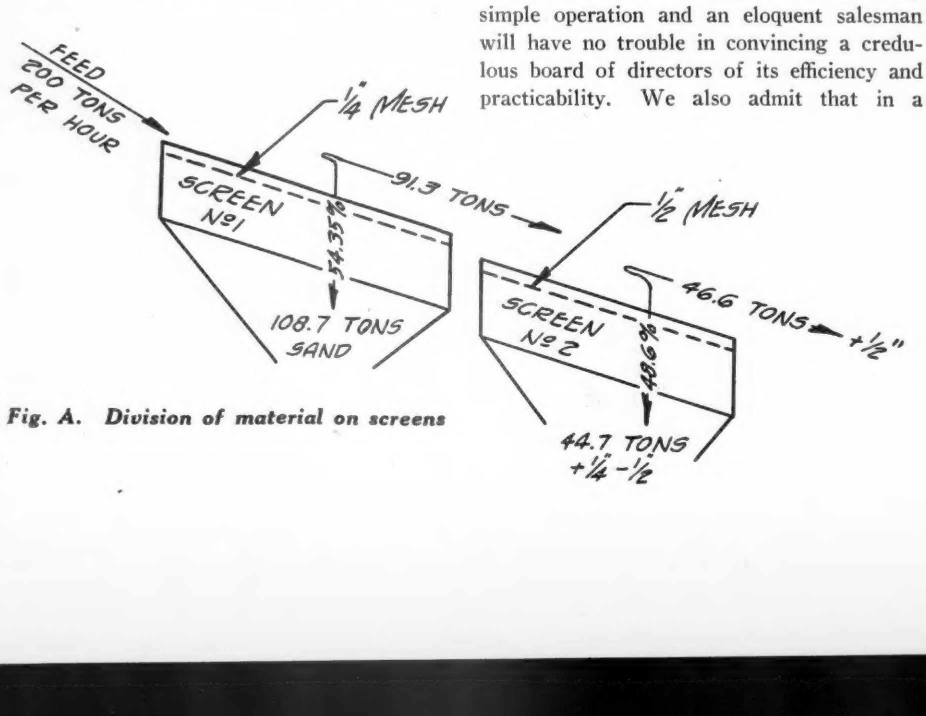
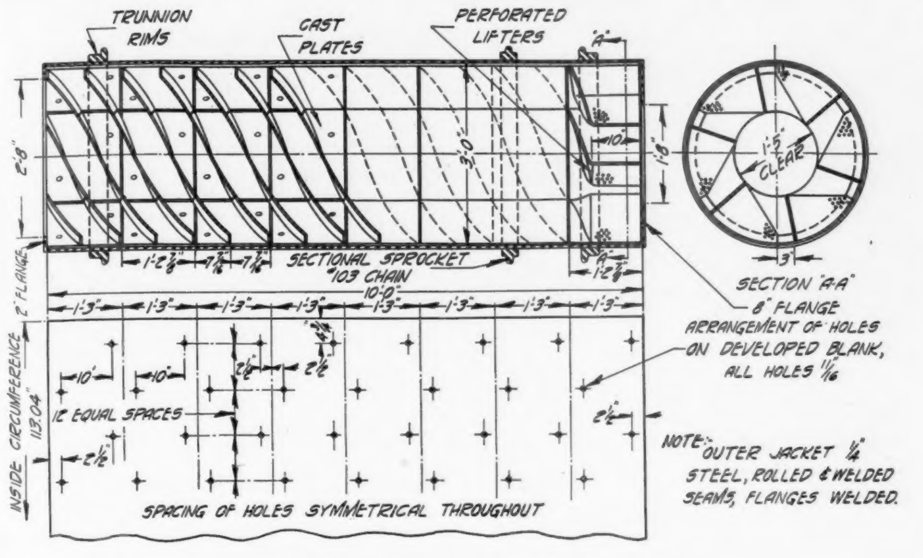


Fig. A. Division of material on screens



Scrubber design recommended by the author

ing area is essential. Furthermore, this being an unusually hard separation, the wear on this screen will be hard and replacements heavy. We therefore turn to Method No. 1.

Two vibrating screens *A* 3 ft. by 6 ft. will handle 54 tons of sand per hour with the help of the larger stones. The product of the last section of these screens indicated *E* is fed into a separate chute and discarded, thereby ridding ourselves of the excess minus ¼-in. plus 10-mesh aggregate. The preliminary separation at the revolving screen takes out all material larger than ¾ in. The oversize is fed to a crusher and returned to the screen since the operation is a closed circuit. All subsequent separations are simple to make, since they are not out of proportion, except that some flexible provision will have to be made to regulate the pea gravel in relation to the ⅝-in. gravel.

This particular installation is in operation today and does efficient work. While it seems a lot of screens for the tonnage, it certainly is not overdone considering the class of material handled. The presence of roots does not simplify the proposition and occasional clay layers add to the grief. Replacements are easy to make since all screens are easily accessible.

Scrubbing

A scrubber is necessary in connection with certain deposits. However, since this piece of machinery is always heavy and cumbersome, the idea evolved by a very progressive state official, illustrated here, seems to us to possess great merit.

In connection with the screening problem just mentioned, or rather as the result of it, some of the gravel was not clean enough. Added rinsing operations did not overcome this defect, since the stones were coated with a tenacious layer of clay. Also the gravel in this section is of rather irregular shape and pitted. It does not wash easily. Small particles of roots which were not screened out helped to make the product look bad.

A small scrubber was designed and the screened gravel fed through it. This unit certainly deserves consideration, since it takes up little room and does the work 100%, removing all floating matter, such as roots, and it removes the objectionable coating of clay. This scrubber will handle about 60 tons of material per hour and can be installed wherever needed.

The drawing should enable anyone to build such a unit and we guarantee it to be well worth the investment. The machine is operated without any pitch, the spiral vanes moving the gravel towards the discharge. The clean water enters at the discharge and leaves at the feed end of the scrubber. It is operated at 15 r.p.m. and a 5-hp. motor is sufficient to drive it.

The advantage of such a scrubber is the fact that it has to handle only such material as needs the treatment, and will therefore do its work more efficiently, since most of the loam and dirt have already been removed.

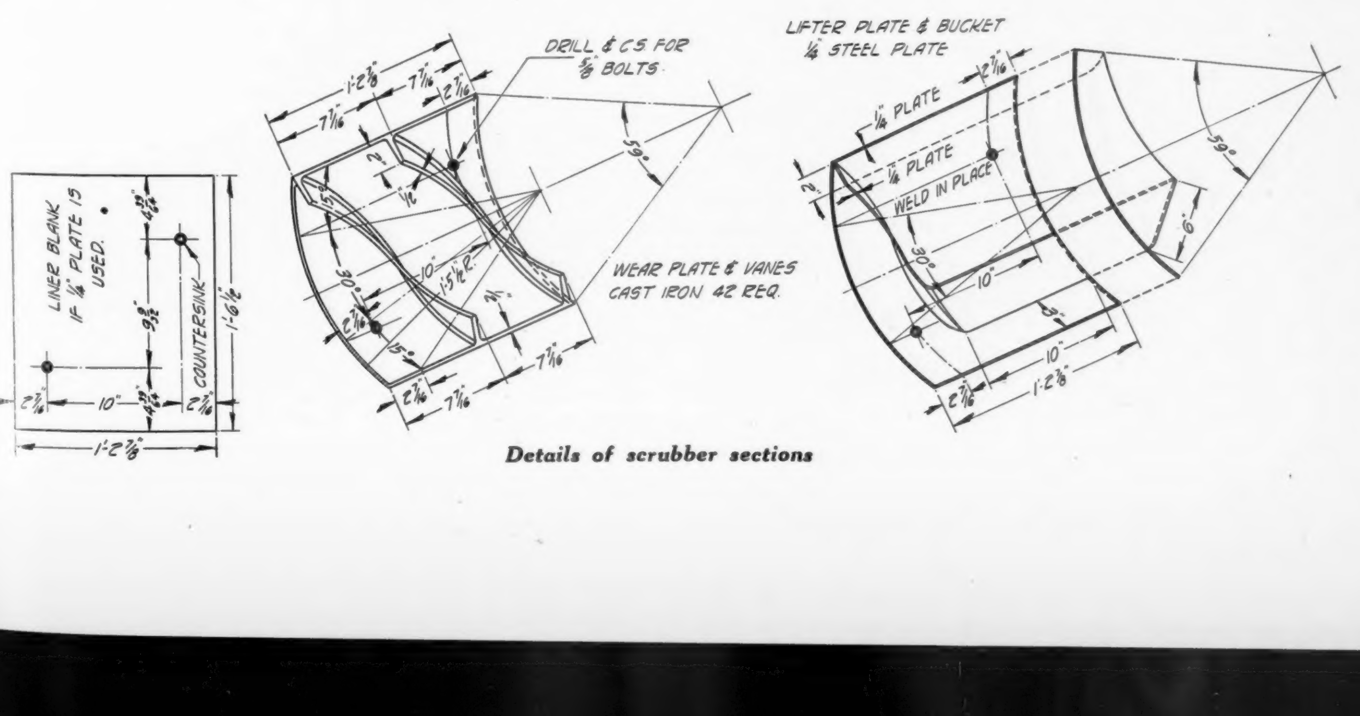
(*To be concluded*)

Report of the Ninth Annual Asphalt Paving Conference

THE PRINTED REPORT of the ninth annual Asphalt Paving Conference held at Memphis, Tenn., December 1-5, 1930, was recently issued. This report contains the addresses, papers and discussions of the conference in full. Many illustrations are also shown to bring out points more clearly.

At this conference the use of asphalt in roads, streets, airports, and sidewalks, and maintenance and construction methods in these applications, were discussed in much detail. Over 300 pages are required to record this report and it is in effect a very complete treatise on the subjects included.

Producers of crushed stone and sand and gravel for road construction will be interested in the following reports, as listed: Discussion of mixed-in-place construction by Prevost Hubbard; "Economic Thickness of Foundation and Wearing Course," by Roy M. Green, manager, Western Laboratories; "Mixed-in-Place Gravel and Crushed Stone Roads in the West," by J. T. Pauls, senior highway engineer, U. S. Bureau of Public Roads; "Political and Social Economics of Highway Improvement," by Arthur H. Blanchard, president, International Traffic and Transport Association; "Sand Asphalt Roads in Southeastern Massachusetts," by H. C. Holden, district engineer, Massachusetts State Department of Public Works, and "Sand Asphalt Roads of North Carolina," by W. E. Hawkins, construction engineer, North Carolina Highway Dept.



Details of scrubber sections

Researches on the Rotary Kiln in Cement Manufacture*

Part XXI—Loss in Clinker Output Due to External Radiation Losses from a Modern Rotary Kiln

By Geoffrey Martin

D.Sc. (London and Bristol), Ph.D., F.I.C., F.C.S., M. Inst. Chem. Eng., M. Inst. Struct. Eng., M. Soc. Pub. Analysts, F. Inst. Fuels; Chemical Engineer and Consultant; Former Director of Research of the British Portland Cement Research Association; Author of "Chemical Engineering"

Abstract

BRITISH TESTS at various cement plants, 1920 to 1924, show that 5 1-2% of the total heat liberated in a rotary kiln is wasted by external radiation. However, taking into account that only the heat above 1481 deg. F. is effective in forming clinker, these heat losses, which occur mostly in the high temperature zones of the kiln, really mean a loss of effective heat of about 15%.

While "heat balances" of rotary cement kilns have frequently been determined experimentally and the results widely published, our author believes these are of very little practical value because they do not differentiate between high-grade heat (above 1481 deg. F.) and low-grade heat (below that temperature or pressure). So long as there is enough low-grade heat to dry the raw materials and heat them to the calcination temperature, the efficiency of a kiln depends upon the effective use of the high-grade heat units. There is almost always a surplus of low-grade heat.—The Editor.

IN PART XX a perfect kiln was investigated, in which no losses due to either external or internal radiation occurred.

In the ordinary rotary kiln employed in practice, however, there occur very serious thermal losses due to both external and internal radiation losses. How serious are such losses may be gathered from the fact that it is these radiation losses which are the main factors in reducing the output of the kiln from 6.36 tons of standard coal per 100 tons of clinker to, say, 30 tons per 100 tons of clinker (the average figure now prevailing) and render the wet process a practical one.

In the present chapter it is proposed to confine our attention to the loss of clinker output due to *external radiation losses* from the kiln shell to the atmosphere, reserving for the succeeding chapter the treatment of the internal radiation losses.

Actual Loss of Heat About 15%

The British Portland Cement Research Association has during the last few years carried out 29 tests of cement rotary kilns, and has thereby acquired an accurate experimental knowledge of the external radiation losses suffered by modern rotary kilns.

The figures vary somewhat widely. But in one test of the Works No. 16, made in 1920, the total radiation loss came out as equivalent to 5.60 tons of standard coal per 100 tons of coal burnt, or 705.6 B.t.u. per 1 lb. of coal burnt (of 12,600 B.t.u. per lb.).

In the Works No. 26, carried out in 1924, the corresponding figures were 5.61 tons of standard coal per 100 tons of clinker burnt, or 706.7 B.t.u per 1 lb. of standard coal burnt (12,600 B.t.u.).

These figures may be assumed as of the order of the external radiation losses which occur in a good modern rotary cement kiln.

As it is necessary to take some definite figures in our calculations, *we will assume* that *for every* 1 *lb. of standard coal burnt in the furnace some* 700 *B.t.u are wasted in external radiation.*

In other words, for every 12,600 B.t.u. liberated within the kiln, 700 B.t.u are wasted in heating the air around the kiln.

This amounts to an *apparent loss* of heat of only about 5½%.

The real effective loss, however, is nearer 15%, as we will see below, and is, therefore, very serious.

In Parts X, XV and XVI, it has been demonstrated that it is the high-grade heat only—*i. e.,* the heat which is available at a temperature *above* 1481 deg. F. (805 deg. C.) —which is capable of generating clinker. Low-grade heat—heat available below 1481 deg. F.—cannot produce a single ounce of clinker, even if available to the extent of millions of B.t.u.'s.

Consequently, it is the *loss of high-grade heat which is responsible for loss of clinker output.*

The loss of low-grade heat—no matter how large—does not reduce the clinker output by a single particle, provided always there is sufficient low-grade heat available to do the necessary preliminary thermal work of preheating the entering slurry up to the temperature of 1481 deg. F. (805 deg. C.) preparatory to its entering the CO_2 expulsion and clinkering zone.

If there is not sufficient low-grade heat present to do this, its place must be taken by high-grade heat, to the great detriment of clinker output.

This point was developed in detail in Part XVI. In Part X it was shown that it requires 918.6 B.t.u. of high-grade heat (*i. e.,* B.t.u.'s available *above* 1481 deg. F. or 805 deg. C.) to generate 1 lb. of clinker.

A million B.t.u.'s of low-grade heat will not generate a single ounce of clinker.

Must Differentiate Between Low-Grade and High-Grade Heat

Consequently, on examining the thermal losses by external radiation, it is not sufficient to examine them solely by the B.t.u.'s lost, irrespective of the nature of the B.t.u.'s. It makes all the difference in the world to clinker output whether these lost B.t.u.'s come under the category of high-grade heat or low-grade heat.

Therefore, in order to arrive at the loss of clinker output by external radiation, it is very necessary to examine the *source* of the B.t.u.'s. If the B.t.u.'s are *lost* from the clinkering and decarbonating zones, it is obvious that they represent lost *high-grade heat* (as all the gases in these zones are above 1481 deg. F.), whereas any heat lost in the dehydrating and preheating zones—the colder zones of the clinker—merely represent *low-grade heat* (since the gases and material inside are *below* 1481 deg. F.), and so these losses are not serious from the clinker output point of view (although for steam generation or evaporative purposes these losses may be considered serious where waste-heat boilers are in use).

Every 918.6 *B.t.u. lost of high-grade heat represent the loss of* 1 *lb. of potential clinker, as shown in Parts XV and XVI.*

A careful estimation of the radiation losses from different sections of all the ce-

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ment rotary kilns tested by the Research Association gave the following average figures:

	Per cent.	
(1) Radiation loss from clinkering zone	30	67
(2) Radiation loss from CO_2 expulsion zone	37	
(3) Radiation loss from dehydrating and preheating zones	21	
(4) Radiation loss from end sections of kilns	12	
	100	

Hence, if we accept as typical of a modern rotary cement kiln the estimate of the radiation losses made in a preceding paragraph, viz., 700 B.t.u. per 12,600 B.t.u. liberated by 1 lb. of standard coal consumed within the kiln, then we arrive at the following figures.

Per 1 lb. of standard coal burnt in kiln, and thus liberating 12,600 B.t.u. in the kiln, we lose by external radiation:

		B.t.u.	
(1) In the clinkering zone	$0.30 \times 700 = 210$	469	High-grade heat.
(2) In the CO_2 expulsion zone	$0.37 \times 700 = 259$		
(3) In the dehydrating and preheating zones	$0.21 \times 700 = 147$	231	Low-grade heat.
(4) End sections of kiln	$0.12 \times 700 = 84$		
		700	

The heat radiated away from both the hot end section of the kiln and the colder end is classified as low-grade heat because in both cases the gases immediately in contact with the ends are certainly at a temperature below 1481 deg. F. (805 deg. C.).

It will be seen from the foregoing that for every 12,600 B.t.u. liberated within the kiln no less than 469 B.t.u are lost by external radiation from the clinkering and decarbonating zones, and that the whole of these 469 B.t.u represent a loss of *high-grade heat.*

Now the loss from these zones of 918.6 B.t.u. of high-grade heat corresponds to a loss of 1 lb. of clinker. So that a loss of 469 B.t.u. corresponds to a loss of

$$\frac{469}{918.6} = 0.5106 \text{ lb. of clinker.}$$

In other words, per 1 lb. standard coal (of 12,600 B.t.u. per lb.) burnt inside the kiln, we lose the production of 0.510 lb. of clinker through external radiation losses. This is a very serious loss. Thus, take the case of a rotary cement kiln producing 100 lb. of clinker for every 30.120 lb. standard coal burnt.

Then the loss of clinker output by external radiation is

$$30.12 \times 0.5106 = 15.37 \text{ lb. of clinker.}$$

In other words, if we stopped all radiation losses in the upper end of the kiln, then, instead of producing 100 lb. of clinker, we would obtain 115.37 lb. of clinker per 30.12 lb. of coal burnt.

So that the 100 lb. of clinker would now be produced by

$$\frac{30.12 \times 100}{115.37} = 26.1 \text{ lb. of coal.}$$

The table below has been calculated to show the serious practical losses which occur due to kiln external radiation.

Summary

In the present rotary kiln each 1 lb. of standard coal burnt represents a loss of nearly ½ lb. of clinker due to external radiation from the clinkering and CO_2 expulsion zone.

In a cement kiln consuming 30.12 tons of standard coal per 100 tons of clinker produced, a stoppage of all external radiation loss from the clinkering and decarbonating zone would reduce the fuel consumption to 26.1 tons of coal per 100 tons of clinker.

(*To be continued*)

TABLE I—SHOWING SAVING THAT WOULD BE EFFECTED BY STOPPING ALL EXTERNAL RADIATION FROM CLINKERING AND DECARBONATING ZONE OF KILN SHELL

With present external radiation loss from clinkering and decarbonating zone of 469 B.t.u. per 1 lb. of standard coal (12,600 B.t.u. per lb.) burnt		With all external radiation losses stopped from clinkering and decarbonating zone	
Tons of standard coal burnt for 100 tons of clinker produced. x tons	Loss of clinker output due to external radiation from clinkering and decarbonating zone. $0.5106x$ tons	Increased clinker output per x tons of standard coal burnt due to stopping all radiation from clinkering and decarbonating zone. $100 + 0.5106x$	Tons of standard coal consumed per 100 tons of clinker produced when all external radiation is stopped from clinkering and decarbonating zone. $\frac{100x}{100 + 0.5106x}$
20	10.2	110.2	18.14
21	10.72	110.72	18 97
22	11.23	111.23	19.78
23	11.74	111.74	20.51
24	12.25	112.25	21.38
25	12.76	112.76	22.17
26	13.27	113 27	22.95
27	13.79	113.79	23.72
28	14.30	114.30	24.50
29	14.81	114.81	25.26
30	15.32	115.32	26.02
31	15.83	115.83	26.77
32	16.34	116.34	27.51
33	16.85	116.85	28.24
34	17.36	117.36	28.97
35	17.87	117.87	29.70

Hazards of Forecasting Business

IN A RECENT SPEECH, Prof. William Trufant Foster, economist of Pollock Foundation, Boston, Mass., referred to the meeting of a group of leading financial statisticians—experts in business forecasting —in New York on November 4. Professor Foster quoted eight of these experts as follows:

The farmers will not buy much from the proceeds of this harvest; and, with the price declines in process throughout the world, there would seem to be little prospect of any extensive business revival in the near future.

The general prospect is for slow and irregular business for ten years.

I expect to see a long and slow recovery to a general level of subnormal, slow business.

Prices will advance a little from present levels and then fall once more. Recovery will be slow.

Conditions abroad will continue to affect our business conditions here. It is a conservative estimate to say that ten years must elapse before we can see genuinely prosperous business in this country.

Business will come back to fair, slow operations in three years.

The period of readjustment will be long. It will take at least ten years.

We may expect a slow return to a basis on which business can be done at a profit in about three years.

Professor Foster continued: "These pessimistic forecasts were on the fourth of November. But it was the fourth of November of the year 1921. At that time business was actually improving, although the experts did not know it. Within four months the gain was so marked that everybody could see it. Within sixteen months business was so far above normal that the experts became frightened again. Today, the major economic factors are more favorable to a rapid recovery of business than they were in 1921. It is my sober belief that just as the depressionists of 1921 were routed, so the depressionists of 1931 are in for a rude awakening."—*Iron Age.*

Wisconsin Gravel Plant Starts Operations

THE WASHER at the gravel plant erected on the Joseph Stefanski farm on the Plover river in the town of Plover, Wis., began operation May 18.

The pit is approximately two acres in area and tests indicate that it will furnish a very high grade of gravel for concrete work. Tom Curran is in charge of the gravel plant.

Machinery at the pit includes a large combination crane and shovel and a complete washing outfit with a dragline for bringing the material to the washer.—*Wausau* (Wis.) *Record-Herald.*

Hydraulic Lime in Concrete*

By G. W. Hutchinson

Consulting Engineer, Riverton Lime Co., Inc., Riverton, Va.

CONCRETE is a mass of inert aggregate bound by *any* cementitious material, in spite of the rather common view that the binding material must be portland cement. There are other and older materials of a cementitious nature, notably hydraulic lime, that are suitable for concrete and the use of which in combination with portland cement seems to hold much promise for the improvement of concrete, especially in respect to durability. The writer has recently planned a laboratory investigation to determine the value of hydraulic lime in combination with portland cement in making concrete. The observations and test results that follow are based upon this work. The data represent the most comprehensive, if not the only available research into the problem of combining two hydraulic materials in an effort to produce better concrete.

Hydraulic lime is an old material and is recognized as a leader among the so-called permanent building materials. As differentiated from hydrated lime, and from most inert admixtures, it possesses definite hydraulic properties. It has many advantages in regard to weathering, volume change and such other properties as have been shown necessary to improve durability. On the other hand, it does not have the advantage of high-early-strength such as is obtained with portland cement. Such facts suggest that, by a design in which portland cement is used to obtain the greater part of the early strength and hydraulic lime to supply the additional qualities of watertightness, durability, uniformity, etc., a structure may be obtained that increases in quality with age. With regard to all requirements of successful concrete, such a combination presents a better-balanced design than might be obtained with either material alone. In view of the fact that hydrated lime has been used successfully as an inert admixture with portland cement for many years, the production of a material such as hydraulic lime, possessing the same properties as hydrated lime and also definite cementing properties, seems to offer many economic advantages.

The graphs in Fig. 1 show the effect on compressive strength of combining hydraulic lime with portland cement in concrete. It will be noted from the curves at the left that as the amount of hydraulic lime is increased above about 25% in the richer mixtures the volume increase of the concrete due to the hydraulic lime reduces the portland cement content to a point where the strength falls off, as indicated by the change in direction of the curves. The curves at the right (Fig. 1) are corrected for volume increase of the concrete caused by the hydraulic lime; the correction factor is obtained from the data plotted in Fig. 2, showing the relation between increased volume of concrete and per cent. of hydraulic lime added.

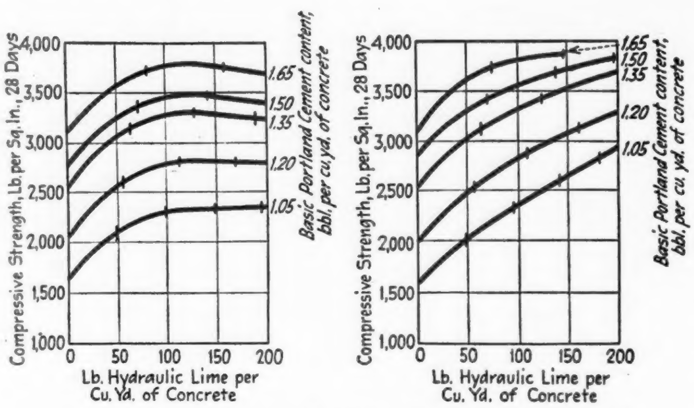


Fig. 1. Effect of combination of hydraulic lime and portland cement on concrete strength

The curves at the right are corrected for the volume increase of the concrete, caused by the addition of hydraulic lime, by means of a correction factor obtained from the data plotted in Fig. 2.

The corrected curves in Fig. 1 (those at the right) show that the compressive strength of the leanest mixture (1.05 bbl. basic portland cement content) to which 50% of hydraulic lime (200 lb.) has been added is of practically the same strength as the straight portland cement mixture containing 1.50 bbl.—about 2900 lb. per sq. in. Thus, the addition of 50% of hydraulic lime to a lean mixture provides the same strength as does a 50% increase in portland cement. The importance of this fact is that the cementitious powder content per cubic yard of concrete of the hydraulic lime mixture is 1½ cu. ft. more than in the straight portland cement mixture. The hydraulic lime, being of greater fineness and plasticity, contributes other factors generally recognized to be desirable for increased uniformity, watertightness, etc. The water-cementitious-material ratio of the combined material is 0.80, while in the mixture using portland cement alone it is 0.92.

With the high strength being secured from present-day portland cements, it becomes more necessary than ever to balance design. To use a given portland cement content with strength as the only consideration would mean that the paste content would be too low in most cases to meet the requirements for workability, watertightness, uniformity, etc., now regarded as criteria of durability and permanence. Fig. 3 indicates the result of portland-cement hydraulic-lime combinations in giving variable strengths with the total paste content constant. Adjustment of the relative amounts of these two materials would allow strength at a given age and the maintenance of a paste content irrespective of strength but consistent with the other requirements of concrete.

In Fig. 1 it was noted that a concrete containing 1.05 bbl. of portland cement and 200 lb. of hydraulic lime had approximately the same strength as a concrete containing 1.50 bbl. of portland alone, but that the water-cementitious material ratio for the former was only 0.80, while for the latter it was 0.92. Data relative to the effect of the water-cementitious-material ratio are plotted in Fig. 4. It will be noted that the top curve A is for portland cement with no hydraulic lime combination and is the usual curve secured by plotting water content against compressive strength with-

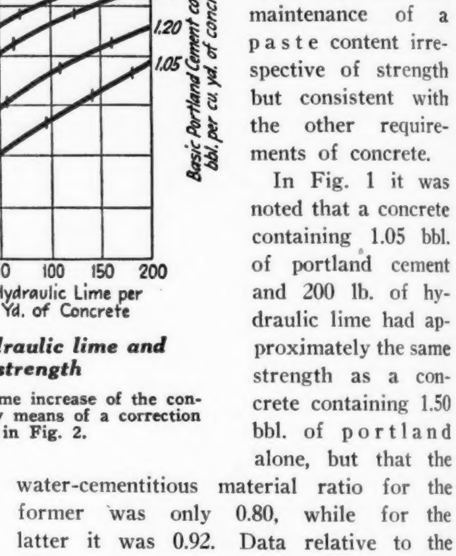


Fig. 2. Effect of hydraulic lime on the volume of concrete

*Reprinted from *Engineering News-Record.*

out consideration for the actual amount of portland cement in the mixture. Curve *F*, on the other hand, represents the mixtures containing a basic amount of portland cement (1.05 bbl.) per cu. yd. of concrete, to which has been added hydraulic lime in various amounts up to 80% by volume of the portland cement content. The curves intersect at the point on curve *A* where 1.05 bbl. of portland cement and no hydraulic lime is used. As the hydraulic lime is added in increasing amounts the curve diverges from curve *A*. The effect of the water content on the strength of the concrete obtained by these changes can be noted by comparing the direction of the curves. For example, the compressive strength of the mixtures on curve *F* is 2500 lb. per sq. in. with a water ratio of 0.85. It becomes 2000 lb. at 1.05, a loss of 500 lb. with an increase of 0.20 in the water ratio. In the portland cement mixture (curve *A*) the same increase in water ratio has decreased the compressive strength from 3200 to 2300 lb., or a decrease of 900 lb. against 500 lb. in the case of the mixture that has used a combination of portland cement and hydraulic lime.

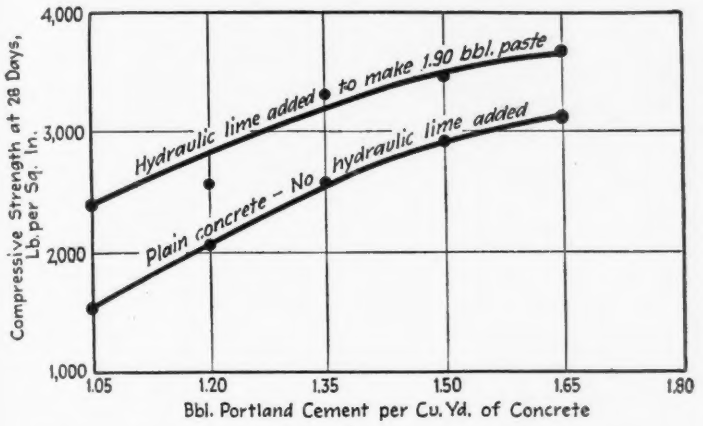


Fig. 3. Effect on concrete strength when hydraulic lime is added to obtain a given paste content

With lack of control existing in present practices of making field concrete, the variation in water content is of importance. Any method by which a greater variation in water content can be tolerated without adverse effect on strength cannot help but be a contribution to the elimination of the nonuniformity well recognized as existing in field concrete.

Conclusions

Concrete of today should not be confined to the use of portland cement alone, for authorities are agreed that strength is no longer the only yardstick by which all properties of concrete may be measured. The need for durability and permanence leads to consideration of the successful performance of other materials.

One of the greatest advances in practicable concrete is the realization that we departed from successful methods when we allowed the modern requirement for speed and low cost to lead us away from the use of drier consistencies.

The water ratio may be applied and will hold true, within limits, for all hydraulic materials. It is not characteristic of portland cement alone.

In making better concrete, two factors must be controlled—design of the mixture and the methods by which concrete is placed in the field. The design of the mixture is of first importance and must provide sufficient plasticity or workability, regardless of other considerations, to prevent segregation. Physical defects are caused by the evaporation of excess water over and above that required for the chemical reactions during hydration. As we are forced to use this excess water in concrete, our only hope is to reduce the amount to a minimum, and to control the bad effects of that we are forced to use by the best means of distributing it uniformly throughout the mass.

It is believed that the tests outlined here are conclusive enough to warrant additional study of the possibilites of hydraulic lime in contributing needed and most valuable properties to concrete.

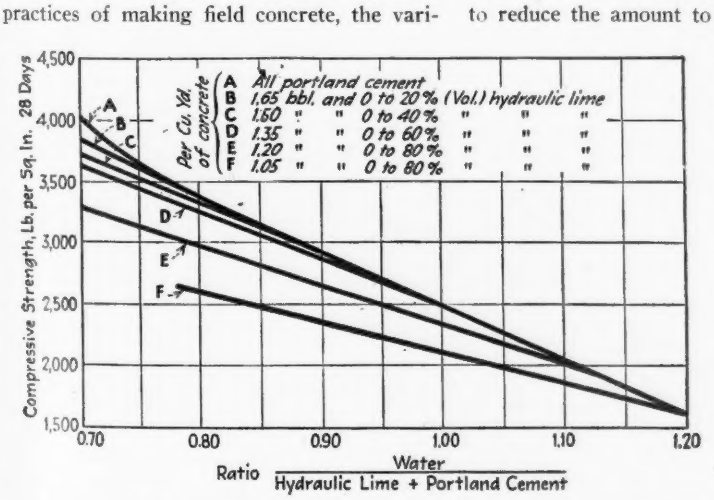


Fig. 4. Change in effect of water ratio on concrete strength with various combinations of hydraulic lime and portland cement

Mt. Taurus, N. Y., Crusher Plant Planned

According to the plans of the Hudson River Stone Corp., which are now nearing completion, a plant having a capacity of approximately 10,000 cu. yd. of crushed stone a day is to be erected on the site of its new granite quarries at Mt. Taurus, just north of Cold Spring, N. Y. Lyons & Slattery, Bronx contracting firm, which is now engaged in clearing the land, will have charge of the layout and erection.

Plans for the general layout of the plant were to be completed June 10, according to the contractors. In the meantime a force of men are engaged in clearing the mountainside. Approximately 300 sq. yd. will be cleared.

Parts of the plant will extend down to the river bank. Storage silos will be built east of the railroad tracks, and trestles will run to a dock which will extend 500 ft. into the river. Most of the shipping will be done by boat, although there will be a certain amount of shipping by truck to nearer points.

The Hudson River Stone Corp. is a newly organized company, formed specially for the development of the Mt. Taurus property.—*Peekskill* (N. Y.) *Star.*

Georgia Rate Ruling Will Cripple Gravel Industry

Rate experts of the Georgia Public Service commission, commenting on the decision of the United States Supreme Court upholding rates on intrastate shipments of sand and gravel in Georgia, said the court's decision will cripple the sand and gravel industry in Georgia.

Members of the Public Service Commission declined comment pending study of the decision. The commission had appealed the order, set forth by the Interstate Commerce Commission, which supplanted lower rates. Prior to the order rates obtaining for intrastate shipments whether over a single or joint haul, were equal with those fixed for a single line haul.

The rate experts said the court's order would force contractors to buy sand and gravel from out of the state.—*Macon* (Ga.) *Telegraph.*

Wisconsin Gravel Pit Opened

The Wissota Sand and Gravel Co., Eau Claire, Wis., has purchased a large tract of land from Edward Novak of Haugen to be used as a gravel pit. The company supplies washed sand and gravel to paving contractors.

The Omaha road will build a spur line to the pit which is located on the west bank of Bear Creek. About thirty men were to be given employment when work started June 8.—*Rice Lake* (Wis.) *Chronotype.*

Lime Manufacturers Hopeful and Their Plans Definite

National Lime Association Annual Meeting at White Sulphur Springs, W. Va., Included Interesting and Helpful Program

WHILE ONLY 20-odd lime manufacturing companies were represented at the annual convention of the National Lime Association at White Sulphur Springs, W. Va., June 3 and 4, the program in every way was one of the best ever presented to the American lime industry, and it is to be regretted that more lime manufacturers were not there to profit by it. Any report of the convention would not do justice to the papers and discussions and the little playlet, "Merchandising Lime," put on by the staff of the association and some representative company salesmen.

President Hough Urges Concentration

In his presidential address, which was extemporaneous, **Norman G. Hough,** of the National Lime Association, had some encouraging things to say in spite of the general business conditions. He emphasized that the chief problem of the lime industry was one of distribution and that the solution could be found only by pooling the efforts and brains of the entire industry. He was not so much concerned with finding new markets as in adequately developing the three present and distinct market channels for lime, each of which presented its own problems.

He lamented the fact that it had been impossible to develop the necessary financial support to carry out the advertising and publicity program which was decided on definitely at the convention in Chicago a year ago, and said that failure to carry out the advertising program had resulted in a distinct falling off of inquiries.

In the field of chemical lime two definite and distinct developments were encouraging. These were the use of lime in water softening and in sewage treatment. To develop the use of lime for water softening will require a more or less separate organization which the Association intends to have as soon as the conditions are right. The sewage treatment promotional work for the use of lime with chlorine is already being done by the Chlorine Institute of New York City, an association of liquid chlorine manufacturers, and lime manufacturers should aid.

In the field of construction lime, much progress is being made in the development of a mortar material composed of two parts of lime to one part of portland cement, and there is every reason to believe that lime mortar will again return to favor as soon as its merits are more fully appreciated.

Norman G. Hough, president

Masonry Mortar

By sincerely digging after facts and developing them and fighting the battles for the masonry mortar business on the outstanding merits of lime mortar rather than on the ground of strength, which is the specially favorable meeting ground of competitive mortar materials, much has been accomplished and much more remains to be done in carrying the message to architects, engineers and builders.

Specifically, the facts developed about masonry mortar take into account nine separate and distinct properties as follows: (1) plasticity; (2) adhesion: (3) volume change after hardening; (4) elasticity; (5) frost resistance; (6) freedom from efflorescence; (7) rate of hardening; (8) absorption and (9) strength.

President Hough insisted that the last quality, strength, was really the least important of any, and that leakage through masonry walls which has been very prevalent within the last 25 or 30 years, was the all important problem of architects and engineers.

Most of the promotional work of the National Lime Association on masonry mortars has been developed at the United States Bureau of Standards in connection with the work financed by the American Face Brick Association on brick masonry, and this is referred to in more detail later on in the abstract of the talk by L. A. Palmer, research engineer of the American Face Brick Association at the United States Bureau of Standards, on "Essential Properties of Mortar in Brick Masonry."

President Hough emphasized the necessity of concentrating the efforts of the Association on fact finding about its own material rather than going after new markets and said he believed that when the facts were established and given adequate publicity, the portland cement industry would co-operate in placing on the market a much more satisfactory mortar material than has been used in the great majority of city building work in the last 25 or 30 years. He said there was no place in the industry for those who will not accept facts and work constructively with these facts.

In sales and promotion, President Hough emphasized that the industry needed strong, able salesmen who would accept their individual responsibility and engage in aggressive sales work, not to take business away from each other but to sell lime. As soon as this was fully understood by the lime industry, the 50% of the manufacturers who are not now supporting the Association would do so as there was no valid reason for their not helping.

Criticizes Federal Trade Commission

President Hough referred to the trade practice conference held two years ago in Washington, D. C., under the auspices of the Federal Trade Commission and said that the high hopes of the industry as a result of this conference had been dashed by the backward steps of the commission since then. The commission subsequently withdrew its approval of the code adopted at the Washington conference and was now asking practical nullification of these rules. He described at length the effort made by the various trade association executives who had been placed in a similar position by the withdrawal of the Federal Trade Commission's support of its codes to put some backbone into the commission but that they had been unsuccessful. He said he believed that the vacillating policy of the commission at the present time had actually done industry a great deal of harm and contended that industry had a right to know what the Federal

Trade Commission can or will do in helping industry to eliminate unfair trade practices.

President Hough also discussed the anti-trust laws but had no recommendation to make as the problem is too complex. He did say there is increasing demand for revision and a fairly widespread feeling that the Sherman anti-trust law is obsolete.

He also discussed the monthly statistics which are gathered and compiled by the Association with the co-operation of 71 manufacturers representing 43% of the production of lime in the United States. He had made an effort to have this work taken over by the United States Bureau of Mines which is already compiling the statistics of the cement and gypsum industries as well as many others, but in order to take on this work the Bureau of Mines needed an additional appropriation from Congress of approximately $5,000, and this appropriation has been included in the appropriation bills to be presented to the next Congress.

Other Association Activities

He mentioned the establishment of the Southern Lime Institute composed of Southern lime manufacturers, with headquarters at Atlanta, Ga., with William H. Lumsden, manager. He said that the institute had been functioning since February 1 and had eliminated 90% of the misunderstanding existing among Southern lime manufacturers and had changed the situation from demoralization to sound marketing practices. The institute is following the trade practice rules voluntarily. President Hough expressed the hope that other groups would be similarly organized in the near future.

Mentioning lime plaster, President Hough had every confidence that if it were studied in the same way as lime mortars are now being studied, the lime industry would be in a fair way to recover much of the plaster business. One great problem is to make lime manufacturers themselves accept the truth about their own product.

In spite of the business conditions which have caused a high mortality in many associations, during the year ended at the convention the lime industry had increased its membership from 80 to 89 member companies, although the production of the 89 members was some 84,000 tons less than the 2,000,000 tons of the 80 members a year ago due to general business conditions.

He emphasized that the only way out of the problems of the lime industry, and other industries as well, was to "dig the way out," that there was a new era coming and that it was no time for fear but for hope. He said the industry must pay fair wages and must make a profit as an alternative to "more Government in business."

Essential Properties of Mortar in Brick Masonry

L. A. Palmer, research associate, American Face Brick Association, United States Bureau of Standards, gave a brief outline of the research work accomplished at the Bureau of Standards to determine the cause of leaky masonry walls, which involved the essential properties of brick mortar. He said strength was a minor matter, that the one big essential was the prevention of transmission of water through masonry walls. He said that the lime manufacturers must study the problems of masonry if they would understand the problems of the lime industry.

Efflorescence, damp interior walls, disintegration, etc., are merely symptoms of the transmission of the water through the walls for which brick are often blamed.

All present cure-alls, he said, are inadequate.

What causes water penetration? Mr. Palmer answered this by saying it was lack of permanency of adhesion of the mortar to the brick. The absorption of the brick or of the mortar material did not have much to do with it. It was actual voids in the material due to their not being directly connected or bonded.

He said the richness of the mortar had little effect on the rate of water transmission because the water penetration was between the brick and the mortar, and while the bricklayer generally gets his full share of the blame, the fault is more often with the mortar materials. Improperly filled joints are often if not largely due to the lack of workability of the mortar.

Mortar also undergoes volume changes, although well burned brick do not have appreciable volume changes. Lime mortar, he said, has been accused of shrinkage, but that was only 50% of the story. The part that has not been told is that this shrinkage in lime mortar is during the *hardening period* and not afterwards. Lime mortar hardens slowly, but when it has hardened it is through with volume change, which is not true of other mortar materials.

"Lime has been pushed out of its legitimate field at least to some extent," said Mr. Palmer, but he believes that when all the facts are known, the mortar business will be regained by the lime industry.

Repairing Leaky Masonry

Stanley Newman, waterproofing engineer, Boston, Mass., presented a splendid supplement to Mr. Palmer's talk by detailing his experience as a contracting engineer whose business it is to stop leaks in masonry walls. He explained how he had begun his career as a waterproofing engineer as a salesman for waterproofing compounds. He prefaced his remarks by saying that he had little knowledge of really good masonry for he was never called in until the leaks had developed. He confined his remarks largely to one subject, the water that gets inside masonry walls. He said he had never seen an entirely wet wall, that porosity of the masonry was not the cause and that dampness because of porosity was a natural asset in preventing the entrance of the water. Mr. Newman said that water could come through the wall in only one way and that was through voids such as shrinkage cracks, etc. Mere absorption was easy to overcome by colorless waterproofing, but such waterproofing would not overcome holes and shrinkage cracks.

He recommended a mortar with plenty of lime and the use of plenty of mortar. He said that there were "more hidden virtues of lime than there were voids in the average wall," which was saying a lot.

He then launched into an interesting discussion of how lacking in ordinary common sense the average architect and builder was and how difficult it was to sell them on the idea that lime mortar was an answer to leaky joints. He even said that he himself had been very much opposed to lime mortar in his earlier experience. He emphasized that adhesion and flowability of the mortar were all important factors because these would insure good mortar joints. He said shrinkage cracks were often too small to be visible.

His work as a waterproofing engineer varies according to the work to be done. It usually consists in digging out the old joints and replacing them with a mortar rich in lime.

It would be impossible to do justice to Mr. Newman's remarks in any sort of a report of his talk because he had a remarkably pleasing personality and his observations were interspersed with reminiscences which made them very entertaining, forceful and effective.

Manufacturers Must Enlarge Outlook

Truman S. Morgan, president of F. W. Dodge Corporation, New York City, publishers of the Dodge Building Statistics and architectural and building papers, in discussing "What to expect in the construction field," said that too much attention was being paid to the present business depression and that such groups as the National Lime Association were too much inclined to consider their own individual problems to the exclusion of the more general one. He emphasized the desirability of lime manufacturers and all other factors in the construction industry working in harmony with local groups.

Mr. Morgan denounced price cutting as fallacious because it lost something of the technique of selling which resulted in too much order-taking. He said a manufacturer of the present day should be able to render a "plus service."

He said he did not believe that the maintenance of high dollar wages necessarily spells prosperity and he reviewed the drift of the building trades wages in various cities of the country. He said they were undergoing a slight change, that there were actually a few increases being made, that there were some cuts even as much as $2 a day, but taken by and large about one-half the cities for which he had reports showed increases while the other half showed decreases.

He said that there were inequalities in wage standards and that the labor engaged in providing shelter, or in the building trades, had profited most by the war conditions and had held its place at the cost of some of the other classes of labor since the war.

Mr. Morgan said the outstanding thing about the statistics of the construction industry at the present time was the small percentage of private enterprise in building and construction. Public work, at the time he spoke, constituted about 64% of all construction in progress or contemplated.

Revise Anti-Trust Laws?

Abram F. Myers, attorney, Washington, D. C., former member and chairman of the Federal Trade Commission, made a definite plea for revision of the Sherman anti-trust laws, although he said he did not know of any business organization which had any definite program in regard to such revision. The American Bar Association, however, he said, did have a program. He said the Sherman law was never intended to shackle honest business and that the Supreme Court has said definitely it refers to *unreasonable* restraint of trade. He said two departments of the Government, working in co-operation, could be a very great help to business, namely the Attorney General's department and the Federal Trade Commission. The prosecuting officer of the Attorney General's office, he said, had discretion to act or not and that it was only right that such prosecuting officer should help to prevent business men from going wrong. He said that Government co-operation had been withdrawn about the time of the beginning of the present depression and was due apparently to Congressional interference.

Mr. Myers said that the trade practice conference co-operation of the Federal Trade Commission had been curtailed now to a point where it was no longer a help but had become a positive hindrance. Due to the anxiety of the commission to strike out anything that might be used as a vehicle for price fixing, it has actually wrecked many long standing practices which have helped to stabilize business as, for example, the striking out of the provision which permitted publication of base price lists.

Mr. Myers described the plan of the American Bar Association to give the Federal Trade Commission capacity to pass on proposals and to give a certain amount of immunity to groups of business men, but he said that if this were done with the present commission, it would be turning over a very important work to a tribunal which has failed miserably in the present crisis. If such a proposition were put through, there should be some requirement for business sense on the part of the members of the commission.

He said the greatest objection to the American Bar Association plan is the throwing of so delicate a subject into the political arena. There are a lot of people who think business should not have any greater latitude than at present and that there is great danger of Government price regulation.

Mr. Myers pointed out the inconsistency of the present plea in official Washington for maintenance of wage scales while at the same time all attempts to fix or maintain prices were frowned upon. He said in a capitalistic society such as ours, public welfare depends on the prosperity of business. He couldn't see why there should be any timidity on price stabilization, but it did call for courage in high public office. He said we may have to have a little judicious price-fixing in this country, and that the authority was vested in the executive power to do it. He lamented the falling off in the attendance at trade association meetings because he said at the present time nothing was more important to industry than thorough and frank discussion of its problems.

"Merchandising Lime"

The lessons of the first day's sessions were very cleverly driven home by a little playlet in which the cast of characters was as follows:

Gas Kilbert, Architect......Henry A. Huschke

A. Limeton Jones, Salesman..Lee S. Trainor
Representing Atlantic Lime Co.

R. Deely, Contractor............Donal O'Connor
President Deely Construction Co.

C. Gager, Ass't. to Deely..W. V. Brumbaugh
Estimator for Deely Construction Co.

I. M. Sullivan, Salesman....George I. Purnell
New York Lime Co.

U. R. Houghton, Salesman....H. A. Huschke
Whole World Lime Co.

P. Mortar Fisher, Salesman........R. P. Stiles
American Mortar Co.

A. Nother Page, Sales Mgr.....N. G. Hough
Whole World Lime Co.

S. Norton, Assistant to Sales Manager....
Whole World Lime Co.
....W. V. Brumbaugh

Messrs. Huschke, Trainor and Brumbaugh are members of the staff of the National Lime Association, Donal O'Connor, New York sales manager of the Rockland and Rockport Lime Corp. and Hoosac Valley Lime Co., George I. Purnell, salesman with the American Lime and Stone Co., Bellefonte, Penn., and R. P. Stiles, salesman with the Warner Co., Philadelphia, Penn.

The playlet showed how the constructive promotional work of the Atlantic Lime Co.'s salesman won over the architect from patent mortar materials to lime mortar and then how the salesmen of the competitive lime companies "queered" the price to the contractor by allowing themselves to be browbeaten by him.

It was stated that the incident was an actual one which had recently occurred, and there wasn't any question that it was more or less typical of what has actually taken place in the lime industry.

Self-Insurance

In the absence of Otho M. Graves, vice-president of the General Crushed Stone Co., who was scheduled to speak on the experience of the General Crushed Stone Co. on self-insurance against employer's liability, **R. P. Blake,** of the Independence Bureau, Philadelphia, Penn., which was the professional adviser to the General Crushed Stone Co. in the installation of its accident prevention and insurance work, spoke extemporaneously very much along the lines of the paper by Mr. Graves at the Safety Congress at Pittsburgh which was abstracted in ROCK PRODUCTS, December 20, 1930. He outlined how the General Crushed Stone Co. had been able to save $72,000 in three years or about 48% of what its insurance would have cost in insurance companies.

He said the General Crushed Stone Co. had 14 quarries and three gravel pits included in its plan. The total number of employes is about 1000 and the annual payroll $1,300,000, so the cost of self-insurance is something less than 4% of the pay-roll, and it usually was about 2 or 3% of the pay-roll.

He emphasized that self-insurance was equally good for a single quarry operation; there was the same opportunity to do intensive safety work, and that the greatest advantage of self-insurance was that it made accident prevention a really serious company business.

Developments in Sewage Treatment

W. V. Brumbaugh, assistant secretary of the National Lime Association and a chemical engineer, described new developments in sewage treatment as follows:

"While the subject of the treatment of sewage is not a new one—the first studies having been made seventy-five years ago in London, followed in 1887 by experimental investigations in Lawrence, Mass., nevertheless the complexity of the process, brought about by the changing character of the waste material to be treated and the chemical and biological reactions involved, necessitates constant new thought and research to cope with the situation and increase the overall effectiveness of the treatment.

"Many processes have been devised, most of which were later discarded in favor of newer and better methods of treatment. Even today there are several different processes, or combinations of these processes, in use for the purification of sewage, but for the purpose of this discussion it is not necessary that the details be presented.

"In recent years lime has been used to a limited extent in certain phases of sewage treatment, chiefly for the adjustment of the pH value, or acid-alkali ratio of the sludge in separate sludge digestion tanks. Moreover, it has been found that in many cases it is only necessary to introduce lime to increase the alkalinity of the sludge in the ini-

tial stages of the biological reaction, after which the process proceeds without additional lime. For this, and perhaps other reasons, it may be said that lime has been losing out in this particular field.

"However, within the past few months, practical application has been made of a new process for treating sewage which will be of interest not only to manufacturers of lime and chlorine, but also to public works officials responsible for the efficient and economical operation of sewage plants.

"The credit for the experimental work in connection with this new idea belongs to L. H. Enslow of the Chlorine Institute, who developed what is now known as the 'Lime-Chlorine' process. It is adaptable to many different stages in the already existing methods of treating sewage and active promotional work is now being initiated by the Chlorine Institute and chlorine manufacturers who are members.

Chlorine More Effective with Lime

"Chlorine has long been recognized as a disinfectant in the treatment of both water and sewage. The research of the Chlorine Institute definitely indicates an increased efficiency in sewage chlorination if the chlorine is applied in combination with lime as calcium hypochlorite. The addition of lime increases the alkalinity of the sewage at the point of application of the chlorine, which results in the chemical formation of the compound known as monochloramine from the ammonia naturally present in sewage. Monochloramine gradually changes to dichloramine, both compounds being effective and persistent in sewage disinfection.

"The process for producing calcium hypochlorite at the sewage plant, which is flexible to the extent of permitting a variation in the lime-chlorine ratio to suit specific circumstances, consists in the introduction of chlorine into a milk of lime suspension. The lime emulsion is made by mixing water with a controlled amount of lime released by dry-feed machines operating continuously. The production of calcium hypochlorite occurs rapidly if proper and efficient mixing of the lime and chlorine is provided.

"While the system affords an opportunity to regulate the ratio of lime and chlorine to meet specific conditions, the use of 1.25 lb. of lime to each pound of chlorine will generally be sufficient to bring about the proper chemical reactions and provide the desired excess alkalinity at the point of application to the sewage. Excess lime above the ratio mentioned will produce no undesirable effect and may actually prove beneficial if the alkalinity of the sewage is abnormally low. Conversely, a decrease in the lime used will lower the efficiency of the process somewhat.

"The important point to remember is that while chlorine alone will do the job if proper attention is given to the installation of equipment and control of the feed, the addition of lime greatly improves the efficiency of the process and at reduced cost. For the sake of brevity, and at the same time to present in as concise a manner as possible the many distinct advantages of the lime-chlorine process, the following points are emphasized:

"1. The lime-chlorine process may be applied to the treatment of sewage at different points for the accomplishment of various purposes such as odor control, sewer protection, disinfection, improved sludge digestion, higher efficiency of clarification in the settling tanks, etc.

"2. For the attainment of a specific result less chlorine is required in the lime-chlorine process than would be necessary if chlorine alone were used. In other words, organic matter consumes less chlorine when lime is present and more bacteria are destroyed.

Bernard L. McNulty, chairman of the board of directors

"3. The cost of chlorination is reduced, even when the cost of adding lime is included. These cost ratios have been repeatedly proven to hold true for various sewages tested.

"4. The compounds known as chloramines, which are produced from the ammonia naturally present in sewage when chlorine is applied in an alkaline carrier such as lime water, are very persistent bactericidal compounds, much more so than ordinary chlorine.

"5. The lime-chlorine process insures the presence of residual chlorine for long periods of time. Therefore, it is of importance in chlorinating sewages some distance ahead of the treatment plant for odor control, sewer protection or disinfection.

"6. In stream and river improvement—such as the prevention of septic action or odor nuisances, for the elimination of slime-like biological growths in the stream, or for algae control—the lime-chlorine process should prove more efficient at less cost than ordinary chlorination.

"7. The application of chlorine fixed as calcium hypochlorite removes the possibility of volatile chlorine being liberated during passage through the treatment plant and pump stations. Thus the hazard of corrosion of equipment and the disagreeableness of working at times in an atmosphere of chlorine are completely avoided. Consequently, the necessity for careful control of the chlorine is lessened.

"8. Because of its non-corrosive nature, the calcium hypochlorite solution can be carried great distances through inexpensive pipe materials, thus reducing installation costs and resulting in greater flexibility of the chlorinating arrangements. If necessary, the solution can be stored in a tank for application at increased rates when required.

"9. The lime emulsion from the lime machines may be diverted in part for other uses at sewage plants wherever required. Chemical precipitation and sludge alkalinization may thus be employed seasonally or intermittently where desirable and from the same equipment used in the lime-chlorine treatment.

"10. The lime-chlorine process may be employed, where necessary, without the use of refined equipment, although this practice is not recommended except for temporary advantages or preliminary experimental purposes.

"11. Smaller sewage treatment plants can effectively use bleaching powder in place of lime and chlorine, thus reducing the cost of installing the process.

"12. Sludge digestion may reasonably be expected to improve through the adoption of the lime-chlorine process, as is already evidenced in sewage plants employing prechlorination without lime. To what extent lime will improve the ordinary chlorine effect in this direction is speculative.

"13. While ordinary chlorine does not show any pronounced effect in improving the efficiency of the activated sludge process in certain types of American plants, the use of bleaching powder in the same type of plant at Barnsley, England, is decidedly beneficial. It is hoped and believed that the lime-chlorine process will produce results similar to those from bleaching powder at the English plant.

"14. In prechlorination, the alkalinizing effect of the lime used with the chlorine may be reasonably expected to produce a higher efficiency of clarification in the settling tanks, if not better separation of grease.

"15. In chlorinating ahead of sewage tanks which have long periods of detention, or low efficiency of solids and oxygen demand reduction, the lime-chlorine process may again be reasonably expected to exceed

ordinary chlorination in over-all effectiveness.

"16. Small quantities of the chlorinated lime water from the pipe line may be drawn for sprinkling around the sewage plant on screenings and at other places of fly-breeding and localized odor production.

"The lime-chlorine process can undoubtedly be effectively applied to every city and town now treating sewage by any of the standard methods in use. Chlorine alone is considered an adjunct of practically every sewage problem and the addition of lime produces the double benefit of improving the efficiency of chlorine and at the same time reducing the cost of such treatment.

"Dayton, Ohio, is now installing the process for the purpose of odor control. Middletown, N. Y., is planning to adopt the new method to eliminate slime-deposition on the surface and beds of streams.

"The lime-chlorine process is now being used in Baltimore, Md., purely to control algae development and to eliminate nuisance from the tidal waters, receiving 69 to 90 million gallons of the treated sewage plant effluent each 24 hours. At the present rate of application, from 290 to 385 tons of chlorine and from 360 to 430 tons of lime will be required annually. Although recently installed, the process is producing results which pass original expectations.

"A number of other cities and towns are now considering adoption of the process in one or more phases of their sewage treatment, with the idea of securing more efficient treatment at a reduction in operating costs.

"Additional details of this process are given in an article by Linn H. Enslow, entitled 'Ammonia-Chlorine Reactions and Lime-Chlorine Process,' which was published in the March, 1931, issue of *Water Works and Sewerage*. (Vol. 78, No. 3, pp. 55-59)."

Better Business Through Better Methods

Charles F. Abbott, executive director, American Institute of Steel Construction, delivered a splendid address which is given in full in what follows:

"Business in all lines has been bumping along on the bottom of one of the worst depressions we have ever gone through. We have been faced with the necessity of coping with a reduced volume of consumption and a radical reduction in prices. In intensity few previous depressions have been as severe, nor probably as protracted.

"But we have always recovered and we have always benefited from these strained times. To bemoan the losses, or exaggerate the distress will contribute nothing toward the recovery. Man is a thinking human being. It is his capacity to reason things out that lifts him above the category of the animal. This is a time for an exercise of our God-given ability to think.

"In a period like that we have been going through it seems difficult for some to recognize that operating policies in a factory must be based upon conditions of sale. They are too frequently formulated by disregarding those conditions.

"Industry must understand and accept the theory of stabilized production. It must recognize the folly of attempting to operate a plant on a basis of 100% capacity output when statistics indicate a demand of but 50% of plant capacity. It must recognize the spirit of live and let live, and overcome that of selfishness which induces others to enter into a war of price cutting in an attempt to keep operating at like capacity. It must adopt the formula of total cost plus profit in fixing selling prices.

"Is capacity production at a net loss more desirable than 60% or 80% output at a profit? If one competitor wastes his capital assets, must every other seller in competition match his destructive, ignorant policy?

"In a number of industries there has been severe trade depression. There we recognize inefficient methods that have obliterated all semblance of salesmanship. If the tendency in this direction continues at its present rate, it threatens to develop into trade prostration of the worst kind. The best hope of checking this trend lies in convincing sales executives that volume should not be the sole aim of business.

Uphold the Sales Price!

"If Moses had given us eleven commandments instead of ten, the eleventh might well have been 'Uphold the Sales Price.' Short of downright dishonesty, there is nothing so unethical in business as cutting the price for the sake of getting an order.

"Unless price cutting is stopped and prices are advanced to the point where they will show a reasonable profit, then wages must be reduced, increasing the volume of unemployment. Wage scales cannot be maintained and the unemployment problem cannot be solved unless profits can be realized.

"If we stop to reason the matter out, eliminating all of the disturbing speculative element, would it not be possible that we would find that American business has slipped back into the jungle and must start all over again the slow process of evolution?

"Whenever a seller becomes recognized by his competitors as a price cutter, his troubles begin. Whenever he submits competitive bids he becomes the target at which his competitors shoot their prices. The individual who relies upon price cutting as a means of obtaining his business becomes a marked man and his days are numbered. The life of a price cutter is not a pleasant one nor a long one. The trouble with the price cutter is that he spends all of his time trying to close the order. If he would devote as much time to convincing his prospect he would find that when he is convinced he closes himself.

"There is no credit to anyone when an order is taken at a cut price. The buyer may gain a temporary benefit and the seller has the order, but in the end both buyer and seller lose far more than they gain. The buyer offers encouragement to price demoralization and he can never tell whether his price is right on his future purchases. The seller reduces his profit and in the end he may find himself giving away a part of his capital assets.

"Nothing is so easy as to cut prices; and nothing is so hard as to get them back when once they have been pulled down. Any child can break an egg by throwing it on the floor, but all the learned scientists in the world cannot pick it up again. Any fool can cut prices, but it requires the combined power of the industry to put them back again.

"There is only one way to make money in business. That way is to sell the product at a profit. The fact that there are many in every line who are making a profit proves that knowledge and self-restraint are not without their rewards.

"It takes courage to look a large order square in the face and say 'No' if it is not in accord with established terms and prices. Nevertheless, there are concerns in highly competitive industries that are displaying that courage year in and year out. True, they may not have the big volume, but they have not been drowned in red ink.

"Of course you cannot get all orders without price being the inducement in some cases, but there are many other factors worth talking about. When the price is once submitted there should be no further concessions. That is salesmanship.

Business World Needs Exactness

"The whole structure of business is based upon profit and not upon the mere production or exchange of commodities. Business success demands exactness. The world is filled with men who guess, or assume, or are led to understand, that a certain figure is nearly, or approximately, or to all intents, accurate. But they are bossed by the man who knows.

"There are many concerns without adequate cost systems and there are others who supplant their cost figures with a system of outguessing competition in computing their selling prices. A disregard of cost figures will eventually invite bankruptcy.

"Business men can solve this problem to their own satisfaction and to their own financial success if they know accurately their costs and refuse to be bluffed into a sale at a price which will not cover those costs plus a fair profit.

"When business men will give heed to the obvious way out of their difficulties they will be in a better position to plan intelligently. When industry holds fast to the fundamental law of profitable business it will become profit-minded, and that is a long way toward the goal of success. There is no substitute, however, for individual responsibility, and no hope of effective cooperation without it.

"The market value of any business depends upon the amount and regularity of its profits. Real estate and inventories do not add much to market value. The real market

value is determined by the efficiency of the whole organization and its profit-making ability. Bankers are searching day and night for the profit-makers and they run away very fast when the profit account is missing.

"If demoralized price cutting is to be eliminated and the business transacted on a basis of profit, the manufacturer must exert his leadership, and in the formulation of his selling policy, he must define fair practices and then vigorously enforce them without any partiality or deviation. One of the most constructive influences is the establishment of a one-price policy, thereby establishing prices and discounts that will be fair to all.

"While the law of supply and demand operates it is economically sound for the buyer to try to get the best possible price, but to drive the bargain below the line of a fair profit, good quality, and proper service, is poor business in the long run. Substitutions, inferior quality, and inadequate service logically follow. The buyer suffers and pays a much greater price in the end.

"The buyer and the seller are as dependent upon each other as are the producer and distributor of the product. In the long run, buyer and seller alike will be adversely affected by any influence which undermines the stability of the other. The best assurances for the consistent prosperity and progress of both, and of American business as a whole, lies in active co-operation to foster constructive influences and stamp out those, such as price cutting, which are responsible for destructive competition and that menace the welfare of all concerned.

Distinction Between "Lawful" and "Unlawful" Price-Cutting

"It is not the lawful reduction of prices that I condemn. We must recognize the ethical distinction between necessary price reductions and price cutting which is inspired by a selfish desire to obtain more than a reasonable proportion of business.

"Prices that are reduced to dispose of excess inventories or to meet emergency conditions confronting a producer would not, and should not, be classified as illegal price cutting.

"On the other hand, prices that are cut for the purpose of taking business away from others who may be entitled to it, is an objectionable form of price cutting. Under the spirit of the Clayton Act such practices, I firmly believe, are illegal. Cut prices to obtain more than one's share of business or to obtain business on a price basis alone is another form of price cutting that is reprehensible. To submit one price, only to return and submit three or four additional and lower prices, thereby starting a price cutting orgy, represents a vicious form of price cutting.

"The Clayton act plainly condemns price discriminations which are designed for the purpose of lessening competition. The idea behind the federal law is in line with what we all believe in, and I feel confident that we could cure the evils of price cutting today were we not likely to lose our way in the morass of legal technicality that so often follows when we depend entirely upon the courts to correct economic evils.

Reforms Must Come from Within

"Reforms are difficult to realize when left to the compulsion of law and administration. Reform must exist in the hearts of men before it is really accomplished. Therefore no statute will ever cure business men of the evils of price cutting until business men cure themselves individually of all desire to indulge in evil practices. We must convince ourselves of the desirability of the right before we can attain it.

"Every now and then someone bobs up announcing a newly discovered plan to relieve some industry of all of its difficulties. Meetings are held and the plan is launched amidst great enthusiasm. But the first stop of the joy ride is usually at the office of the Department of Justice in Washington. As far as I know no one has as yet ever devised a legal plan to get around the anti-trust laws and do things that the laws specifically state must not be done.

"Most men will agree that prices are lower, that profits have become impaired and that competition is more difficult to meet. It is a strange phenomenon in some as they are left hopelessly struggling for a solution and relief from the perplexing difficulties with which business has become afflicted.

"The anti-trust laws, with some of their now obsolete interpretations and many doubtful regulations under them, are probably responsible for some of the business man's worries. A modification of these laws with intelligent interpretations would undoubtedly offer relief; but by no means are they alone responsible for the new conditions now confronting our business activities, nor would their repeal remove the principal present day problems.

Revise Anti-Trust Laws?

"The argument for such a revision is valid in itself for the anti-trust laws were enacted to prevent restraint of trade rather than to forbid all trade agreements. Therefore trade agreements which have for their purpose the conservation of a product for the best interest of the public or the saving of an industry would not necessarily come under the prohibition of the intent of the framers of the statutes. It is becoming more and more apparent that production in important fields has outgrown many of the rulings under the anti-trust laws.

"While modifications are undoubtedly necessary, it is well to remember that extreme selfishness on the part of some with a disregard of the rights of others, represents a principal evil. Until individual selfishness can give way to justice and fairness with the spirit of the industry of paramount importance, we cannot expect any relief even though the laws might be modified. It is only through honest co-operation that enlightened selfishness can possibly dissipate ignorant competition which is the real hazard.

"The cause of price cutting is to be found in the mental qualities of the cutter. Ignorance, misunderstandings, confusion, greed, distrust and antagonism are the destructive elements. The solution of the problem involves the curing or elimination of these qualities. Failure to do so means continued unprofitable operation.

Who Is to Blame for Price-Cutting?

"Who is to blame for price demoralization in an industry? Is it the salesmen or their superiors? In my opinion the criticism that has been levied against the salesmen during the past two years has been unjust. They have too frequently been instructed by their superiors to obtain volume without regard to price and reluctantly followed instructions. Salesmen as a rule have been trained to think in terms of profits and that is the principal incentive upon which sound salesmanship is based.

"Our only legal cure of the evil is education. By hammering indisputable facts home again and again to every member of an industry the influences that promote price cutting can be reversed.

"Education should start by destroying the illusion that greater profits can be obtained from an increase in volume secured by price cutting. When this illusion has been destroyed the root of the price cutting evil will be eliminated.

"We can do much to effect this education through co-operation, through coming together and honestly discussing our problems. Around a conference table, in trade association meetings, this education is possible, and without circumscribing the rights of individuals.

"The idea of compulsion does not sit well with an American and I venture to say that should we have such a law as exists in some other important commercial nations compelling membership in trade associations we might lose some of the vital force in our present system of industrial co-operation. Voluntary adhesion to a trade agreement is far more effective. But that does not blind us to the fact that the greatest weakness at present in our trade association movement is the inability of obtaining the membership of all who are profiting from the fruits of the co-operative. There are, even in times less depressing than the present, certain non-members who prefer to ride free. They take their profit from improvements in industries effected through trade associations without being willing to stand their part of the expenses.

Trade Associations Most Needed in Depressions

"When business is depressed through agencies outside the control of trade associations the need for greater cohesion within

the industry is even more essential. Especially is this true in the financing of trade associations if predicated upon a volume tax on the production, as is nearly always the case. During the past year most trade associations have been forced to exercise economy without regard to the importance of the work they were engaged upon. And yet present conditions call for organized, intelligent industrial leadership which is possible only through the trade organization.

"Industrial associations are not only essential in promoting progress, but they are a necessary benefit to members, to customers and to the public. Most of the problems that confront the individual business man are shared equally with his competitors, his customers and his public. He cannot solve them alone. Success will depend upon the co-operation of all interests involved.

"Trade organizations can be no greater, no stronger than the members who respect them and give them their confidence. They are as impotent as those who scoff at humanity's weakness. We cannot bring back by wishing, or by mandates against normal economic law a business that was constructed on unsound, inefficient principles, or avaricious individualism.

"Every industry has its problems, some basically economic, others more specifically related to production or selling, that can be overcome more effectively by co-operation than by any individual action. The individual concern unaided cannot cope with this modern day struggle for markets. The forces that are marshalled against it are too great. The battle-line is too far-flung. The vision to see that the individual concern can prosper only as the industry prospers, offers the sole hope of survival.

"Such co-operative activity, aimed primarily at better merchandising methods, offers the one assurance of prosperity. During this period of stress the problem is to locate buyers to absorb what we produce, to make them want what we have for sale.

Management Needs More Facts

"Is management really conversant with all of the facts that would enable it fully to appraise the benefits that could be expected from a trade organization? I doubt it.

"The attention and interest of management has been confined largely to their own individual problems without sufficient thought to the work being accomplished by their trade association. They are too prone to look upon membership as a contribution to their industry instead of an investment from which they should insist upon returns.

"Proper appraisal would develop very definite benefits—cost reductions, new opportunities and other factors that should impress any fair minded executive that a properly organized trade association is essential to the future of his own company.

"Many conventions have been held throughout the country during the past two years at which the question of prices and profits has been thoroughly discussed. The way open for improvement has been hammered home time and again. Nearly every member of an industry attending these conferences and conventions will agree with the soundness of the recommendations submitted, but leadership seems to be lacking.

Leadership Lacking

"One of the highest purposes of an organization is to establish the confidence upon which honesty is based. Without honesty there can be no agreements. Honesty can be established as relationships increase, and confidence will replace suspicion. It is a hopeless task to place too great reliance upon mutual agreements until honesty becomes a part of man's character.

"Organized co-operation, supporting a well developed practical program, opens the way for important accomplishments that would advance the industry and promote individual success and public welfare. Research to develop new uses, new markets, and reduce costs, advertising, education, and many similar activities can be economically and more effectively promoted than would be possible if entrusted to individual action.

"There should be no doubt, no hesitation, in the acceptance and application of wholesome co-operative effort among competitors. It offers the only way to a larger business, a better business and satisfactory profits. There is no other answer. Either competition will fall to the level of vicious fighting and trade demoralization, or it must adopt a practical plan of co-operation. Men working together sincerely for a common end and a common purpose, can so organize their energies that problems fade before them and limitations recede. It is then that the individual prospers the most.

The Coming Contest for Business

"The industrial and commercial contest of the next twenty years will be cyclonic in its intensity. It will be vast and magnificent. Sales managers are just beginning to realize that business is in its dawn, and that victories of the past are small in comparison with the victories of the future. Just as the master word of yesterday was 'Initiative'—so the word of today is 'Cooperation' and the word of tomorrow 'Coordination.'

"Without the trade association there is no assurance whatever of a normal stability of an industry. An instance so small as the releasing of a destructive cut price policy usually inspired by some imaginary grievance and by a single company will kindle the flames of bitter retaliation and all the evil consequences of greeds, animosities, hates and jealousies.

"A well organized trade association offers the sole hope of preventing impulsive acts. The appeal to justice and fairness usually succeeds in quieting the vicious thoughts that flash in the heat of temper.

"The lesson of co-operation as advocated by the trade organization has prevented many a costly price war that otherwise would have proved expensive and disastrous for the entire industry.

"The constructive moral influence of the trade association, its respected leadership and its stabilizing qualities all go to create a force of second appeal for calm, patient and fair consideration as substitutes for the rash deeds of temper that otherwise must find some outlet to soothe the mind of the one who thought himself the victim.

"If there was ever a time when the trade associations should receive united moral and financial support it is during periods of distress. It is then that the combined energies of an industry should be set in motion and move forward aggressively. It is no time to retire or withhold support and those who do are actually the ones who are preventing the progress that they, themselves, are most concerned in.

"Business revival always awaits leadership. Problems of an economic nature are so complex that industry must recognize its full responsibility, chart the course and supply the pilots. No harbor is ever reached by merely drifting. We cannot depend upon success that places reliance upon chance, guesswork or assumptions, and we must not hesitate.

The Challenge to Industry

"The challenge to industry today is whether we are going to meet the issue and solve it effectively, or whether we are going to invite the Government to do it for us. You have witnessed what happened in Italy. Extreme individualism in industry and trade has been replaced by a state dictator. Russia is doing the same, only through a differing political method.

"The people of the United States have declared for a democracy and American industry is confronted with the serious necessity of proving that these economic emergencies can be successfully coped with under a democracy, that these business problems can be solved through co-operative effort and without recourse to governmental interference. This is certainly a time when we should be willing to submerge our willful desires, our selfish ambitions for the betterment of our industries and trades and thus prove our ability to co-operate for progress.

"We have this challenge thrown at us by Mussolini and by Stalin. Are we going to acknowledge that our democratic principles are wrong? I think not, for we have learned how to co-operate. The trade associations have demonstrated effectively the power of organized co-operation."

Election of Officers

Bernard L. McNulty, president of the Marblehead Lime Co., Chicago, Ill., who presided throughout the meeting, was re-elected chairman of the board of directors. The other directors chosen at this conven-

tion were C. L. Montgomery, Vermarco Lime Co., West Rutland, Vt.; C. C. Loomis, New England Lime Co., Pittsfield, Mass.; S. W. Stauffer, J. E. Baker Co., York, Penn.; Phil. L. Corson, G. and W. H. Corson, Inc., Plymouth Meeting, Penn.; Ray C. Noll, Whiterock Quarries, Bellefonte, Penn.; James McNamara, Eagle Rock Lime Co., Eagle Rock, Va.; G. J. Whelan, Kelley Island Lime and Transport Co., Cleveland, Ohio; W. H. Moores, Moores Lime Co., Springfield, Ohio; G. J. Nicholson, Inland Lime and Stone Co., Manistique, Mich.; E. S. Healey, Glencoe Lime and Cement Co., St. Louis, Mo.; F. C. Cheney, Cheney Lime Co., Birmingham, Ala.; J. F. Pollock, Ash Grove Lime and Portland Cement Co., Kansas City, Mo.; I. A. Ogden, Dittlinger Lime Co., New Braunfels, Tex.; J. S. McMillen, Roche Harbor Lime and Cement Co., Roche Harbor, Wash., and R. E. Tremoureux, United States Lime Products Corp., San Francisco, Calif.

The principal feature of the banquet entertainment was a humorous address by Sir Frederick McGill, correspondent of a London newspaper, on "America as I Have Seen It."

Michigan Gravel Suit Ends

DAMAGES of $155,000 were awarded the Federal Gravel Co., Saginaw, Mich., and the Michigan Gravel Co., and the Detroit and Mackinac Railroad Co. was restrained from giving discriminatory freight rates to the Alpena Gravel Co., which in turn was restrained from using property of the railroad without paying a fair compensation, in an opinion handed down May 29 by Circuit Judge Samuel G. Houghton.

The opinion is the latest action in a suit which has been dragging out for more than three years.

The plaintiff concern owned two gravel pits, one at Emerson, the other at Greenbush which, according to the testimony, were operated profitably during the years 1919, 1920, and 1921. In 1922, the railroad company began operation of the "Big Cut" gravel pit, and the testimony showed that the Greenbush pit of the Federal Gravel Co. operated at a loss from 1922 to 1925, when it was closed. The Emerson pit operated at a loss until 1924, when it was closed. The Federal Gravel Co. later disposed of the pits for $45,000.—*Bay City* (Mich.) *Times.*

Heating and Drying Granular Materials by Convection

A STUDY OF THE rate of heat transfer from hot gases to granular lumps of *coal, cement, clay,* etc., under varying conditions of lump size, gas velocity and gas temperature has been made and reported by W. Gilbert. Graphs and formulas are given by him from which the rate of drying over a wide range of conditions can be calculated.—*Chemical Abstracts.*

Sand-Lime Brick Production and Shipments in May

THE following data are compiled from reports received direct from 23 producers of sand-lime brick, located in various parts of the United States and Canada. The number of plants reporting is three more than those furnishing statistics for the April estimate, published in the May 23 issue. The statistics below may be regarded as representative of the entire industry in the United States and Canada.

The number of plants reporting in May is three more than in the previous month, and the figures include reports from two new contributors to these statistics. Production for the month of May shows an increase. On shipments, those by rail showed a decrease, while there was an increase in truck shipments. Stocks on hand decreased considerably, while unfilled orders show an increase.

Average Prices for May

Shipping point	Plant price	Delivered
Atlantic City, N. J.	$10.00	$14.50
Dayton, Ohio	11.00	13.00
Dearborn, Mich.	13.00	14.50
Detroit, Mich.	13.00	15.50
E. Windsor, Ont., Can.	....	17.00
Iona, N. J.	11.00	15.00
Jackson, Mich.	13.00	....
Menominee, Mich.	9.75	13.50
Milwaukee, Wis.	9.00	11.00-12.50
Minneapolis, Minn.	8.50	10.50
Mishawaka, Ind.	11.00	....
Pontiac, Mich.	13.50	15.50
Saginaw, Mich.	12.00	....
Syracuse, N. Y.	18.00	20.00
Toronto, Can.	10.00	12.00

Statistics for April and May

	*April	†May
Production	3,999,410	5,084,457
Shipments (rail)	1,697,882	1,594,890
Shipments (truck)	3,330,089	4,374,806
Stocks on hand	11,118,716	10,724,004
Unfilled orders	5,232,000	6,513,000

*Twenty plants reporting. Incomplete, seven not reporting unfilled orders.

†Twenty-three plants reporting. Incomplete, two not reporting stocks on hand and four not reporting unfilled orders.

Notes from Producers

Belt Line Brick Co., Minneapolis, Minn., reports that it resumed operations June 1.

Jackson Brick Co., Jackson, Mich., has prepared a very attractive mailing piece for the trade. The circular shows a photograph of the general offices of the Consumers Power Co., Jackson, for which structure 1,000,000 sand-lime common brick were used.

Calendar Reform

TO PRESENT the advantages of a revised twelve-month calendar the *Journal of Calendar Reform* has been issued, dated June, 1931. This monthly journal tells the need for change from our present form, then presents and discusses the two most widely considered plans, the thirteen month calendar and the revised twelve month plan.

Canadian Tariff Increases Affecting Rock Products

IN HIS BUDGET SPEECH in the House of Commons June 1, Premier R. B. Bennett announced the following tariff increases and changes affecting stone and rock products.

The number at the start of each paragraph is the number it will take in the new Canadian tariff schedule. The first rates are the new British preference, with the old British preference in brackets. The Intermediate rate, applicable to all foreign nations with which Canada has a trade agreement, comes next, with the old Intermediate in brackets, and the final rate is the General Rate, applicable to the United States, and other countries with which Canada has no trade agreement, followed by the old General Rate in brackets.

296B—Magnesite, dead-burned, sintered, caustic-calcined or plastic magnesia; magnesium carbonate, basic or otherwise, excepting crude rock—20% (20%); 27½% (25%); 30% (25%).

296D—Feldspar, ground but not further manufactured—free (free); 20% (10%); 30% (15%).

Calcium Chloride in 1930

THE CALCIUM CHLORIDE produced from natural brines in the United States in 1930 in connection with the manufacture of salt or bromine where the material is an original constituent of the brine, amounted to 116,160 short tons valued at $2,207,800, an increase of 1.7% in quantity and 5% in value over the output of 1929, says a recent report by the Department of Commerce. This salt is obtained from the brines in Michigan, California, West Virginia and Ohio.

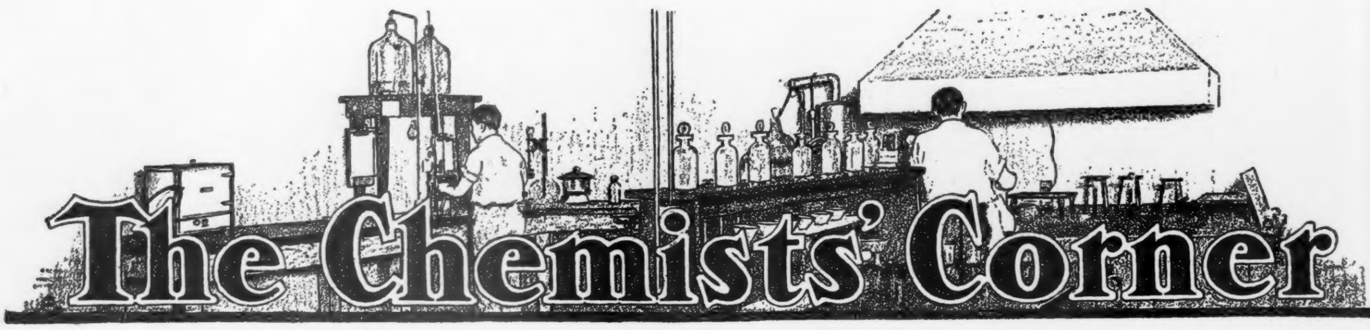
Russian Engineers Visiting Rock Products Operations

TWO ENGINEERS, A. Berg and N. Vetcher, of the U. S. S. R., recent visitors at ROCK PRODUCTS' office, are now making an inspection trip of sand and gravel plants and cement products plants in the United States. They are particularly interested in learning of production methods of these construction materials as used in this country.

Basic Products Co. Changes Name

ANNOUNCEMENT has been made that, effective June 1 Basic Products Co., makers of Green Bag cement, will be known as the Green Bag Cement Co. of West Virginia.

General offices are in Pittsburgh, Penn., and plants are at Neville Island, Penn., and Kenova, W. Va.



Dust Loss From Kettle "Fog Stacks"

By Wallace C. Riddell
Consulting Chemical Engineer, San Francisco, Calif.

SO FAR as known, no technical data are available on the dust losses from the "fog stacks" used in the kettle process for calcining gypsum.

The common practice in the calcination of gypsum by the kettle process is to install a stack from the kettle top leading into an expansion chamber and allow the dust made during calcination to discharge through this expansion chamber into the atmosphere. This "fog stack" varies in size from 24- to 36-in. in diameter and the expansion chambers have various sizes and shapes.

During the past year numerous tests were made on an installation of this type at the Long Beach, Calif., plant of the Standard Gypsum Co. The installation here differs from the ordinary in that the dust escaping from the expansion chamber instead of discharging directly into the atmosphere is passed through a Senseman "water dust" collector. After passing through the water dust collector the steam, practically free from dust, escapes into the air.

This dust collector consists of a specially designed, high speed fan and a cyclone collector designed to separate the water and gypsum, or slurry, from the steam and air. In other respects, the system tested is similar in design to the majority of kettle fog stack equipment.

The expansion chamber here used has an area such that the velocity of the gas through the expansion chamber is reduced by a ratio of 1:6. Rough tests indicate that approximately one-third of the dust leaving the top of the kettle settles out in the expansion chamber and is returned to the kettle and two-thirds passes into the water dust collector.

To one familiar with the process of calcining gypsum, it is obviously difficult to measure the quantity of dust going to the expansion chamber due to the clogging of tubes and filter mediums with set gypsum. No such difficulties are encountered in determining the actual quantity of dust entrapped by the water dust collector. Here the gypsum is in suspension as a thin slurry or sludge and the volume and analysis of this can be readily and accurately measured. The quantity of gypsum dust in the gases escaping from the outlet of the water dust collector cyclone can also be determined. While this is not as readily and accurately done, it can be accomplished with a fair degree of accuracy.

The method used in determining the gypsum in the escaping gases was by the use of a familiar type of flow meter. A definite volume of the gases was metered through this flow meter and passed through wash bottles. The gypsum content of the slurry and wash bottle solutions was determined by precipitation as barium sulphate.

The method used for determining the quantity of gypsum in the escaping gases from the water dust collector is subject to criticism in that the volume of gas passed through the flow meter as compared to the total volume of escaping gas was small. However, in several tests, comparatively large volumes of gas were filtered which gave results differing only slightly from the flow meter method. This method was finally adopted for routine work.

(Fig. 1 shows the "set-up" of the flow meter and equipment for measuring the quantity of gypsum dust in the escaping steam from the water dust collector.)

Table 1 gives the results of several typical tests taken during the past several months.

TABLE I—RESULTS OF TESTS OF GYPSUM DUST RECOVERY

Test No.	Calcining time hr.-min.	Weight of slurry collected lb. per hr.	Amount solids in slurry per cent.	Weight of solids recovered in slurry lb. per hr.	Weight solids lost in gases into air lb. per hr.	Total kettle dust on basis raw gypsum feed lb. per hr.	Total kettle dust loss on basis raw gypsum feed per cent.
1-13-30	2:35	2750	9.65	128	1.17	129.17	1.19
2-17-30	2:25	2600	5.39	140	1.36	141.36	1.31
3-11-30	2:30	4590	3.02	148	0.60	148.60	1.39
4- 8-30	2:45	4740	3.25	154	0.87	154.87	1.44
5- 1-30	2:30	4500	3.65	164	0.85	164.85	1.52
6-17-30	2:45	3700	4.29	159	0.83	159.83	1.48
7-21-30	2:40	3960	4.08	166	0.98	166.98	1.55
Average	2:36	3834	4.05	151	0.95	152	1.41

Average rate of raw gypsum feed was 10,800 lb. per hr.
Average fineness gypsum feed % passing 100-mesh = 95.5.
Average fineness gypsum feed % passing 200-mesh = 84.0.
Average production of calcined gypsum was 9100 lb. per hr.
Average calcining time per charge equals 2 hr. and 36 min.
Average analysis of dry solids in slurry:

Insoluble (SiO_2 + silicates)	1.80%
Iron and aluminum oxides $Fe_2O_3 + Al_2O_3$	0.30%
Calcium carbonate $CaCO_3$	0.80%
Calcium sulphate $CaSO_4$	76.35%
Combined water H_2O	20.20%
Total	99.45%
Gypsum content $CaSO_4 \cdot 2H_2O$	96.55%

Average weight of dust entrapped by water dust collector equals 151 lb. per hr.

Average weight of dust escaping with steam and air into the atmosphere equals 0.95 lb. per hr.

Average kettle dust loss per hour equals 152 lb. or 1.41% on basis of gypsum feed. This is equivalent to 1.68% on basis of calcined gypsum produced.

Portion of total dust escaping from kettle exit "fog stack" which is discharged into the atmosphere equals 0.95 lb. per hr. or 0.62%.

Water dust collector efficiency equals 99.38%.

It should be noted that besides arresting the gypsum dust, approximately two-thirds of the steam leaving the kettle stack is condensed in the collector.

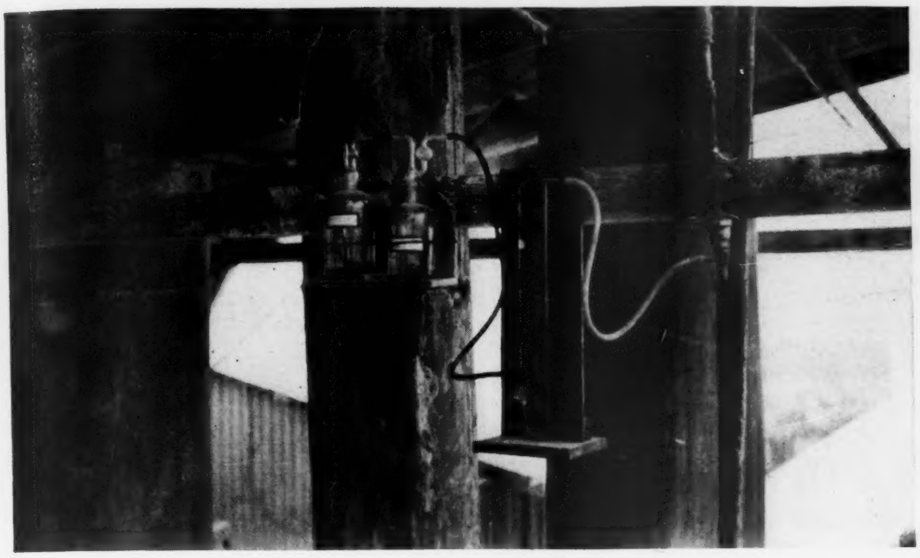


Fig. 1. Flow meter used at Long Beach plant for the determination of dust in kettle fog stack gases

These tests do not differ materially from similar tests made during the past two years. With a properly designed "fog box" or expansion chamber, we believe that they fairly accurately represent the average dust loss in calcining rock gypsum by the kettle process.

Comparison of the dust loss from the kettle process with other types of calcining apparatus for fine materials, such as the rotary kiln, indicates that this process produces considerably less dust.

The tests also indicate the remarkable efficiency of the Senseman water dust collector when operating on such material as gypsum.

Action of Sulphate Water on Concrete

TESTS of many cylinders stored in Medicine Lake near Watertown, S. D., have been made since those reported in *Public Roads* of October, 1925, and November, 1927. The new tests include some at 3 and 5 years of cylinders from the earlier series and 1 and 3 year tests of cylinders installed in the lake since 1927. These tests were planned primarily to develop drain tile to resist Minnesota soil conditions. The results are of general interest and value, however, as sulphate waters are found in many localities.

A report of later results of these tests was published in the May issue of *Public Roads*. The following is a brief summary of the report as published.

No attempt has been made to show the direct influence of aggregate grading, water-cement ratio, quantity of cement in the mix, and those other factors well recognized as greatly affecting the 28-day strength. Instead, it was assumed that, for any given set of conditions, concrete with the highest 28-day strength is most resistant to disintegration and, therefore, that comparative tests to show the influence of a single variable, using this type of concrete, would give the most consistent results possible.

Nearly 6000 cylinders were tested to determine the effect of curing in water vapor on the resistance of concrete to the action of sulphur water. While it is said to be too early to formulate final conclusions on this subject the following are some of the general conclusions that have been drawn, based on tests to date: (1) Curing in water vapor at temperatures between 100 deg. and 190 deg. F. did not generally increase resistance of concrete to the action of sulphate waters; on the contrary, in some cases a decrease was indicated. An exception to this occurred where certain admixtures were used.

(2) Curing concrete in water vapor at temperatures of 212 deg. F. and upward markedly increased resistance to the action of sulphate waters with the data definitely indicating increase of resistance with increase of curing temperatures between 212 deg. and 285 deg. F. for a 12-hour curing period. (3) Curing concrete in water vapor at 212 deg. F. has been more effective in developing resistance to the action of sulphate waters when continued for six days than when continued but two days; and (4) Regardless of whatever chemical or physical changes in portland cement increase resistance, following curing in water vapor at temperatures of 212 deg. F. and upward, hydration of the cement grains is very greatly accelerated.

Field tests of high alumina cements have shown remarkably high resistance to the conditions prevalent at Medicine Lake. From these tests it is concluded that: (*a*) High alumina cement cylinders buried 4 to 5 ft. deep in neutral soils have consistently increased in strength up to five years; (*b*) high alumina cement cylinders stored in the laboratory in 1% solutions of sodium sulphate have shown no tendency to test stronger at any age than check cylinders stored in tap water in the same room; (*c*) high alumina cement cylinders stored in tap water in the laboratory have, in several instances, increased in volume, as measured, as much as 0.6 of 1%. Portland cement cylinders under identical storage conditions have rarely increased in volume as much as 0.1 of 1%, and where, following storage in sulphate solutions, they have increased in volume as much as 0.6 of 1% the compressive strength has been only about 50% of normal.

The essentials of the conclusions as to the influence of the various factors considered, on the resistance of concrete to the sulphate water of Medicine Lake, are condensed into the following statements:

1. Resistance has been markedly increased by curing in water vapor at temperatures of 212 deg. F. and upward, almost to the point of immunity to action for the most favorable temperatures and curing periods.
2. Enough difference exists in the resistance of standard portland cements from different mills to justify specifying particular cements for concrete to be subjected to these special conditions of exposure.
3. Special cements, other than high alumina, have been of little or no value.
4. Within the limits of exposure conditions represented by these tests, the behavior of high alumina cement has to date very nearly approached the ideal.
5. From the results of tests up to three years it appears that surface treatments of linseed oil have been of considerable value, with indications that later tests may be less favorable. The Interol treatment was of appreciable value up to five years. The McEverlast treatment showed up favorably at one year, but displayed surface indications of less favorable results at three years and later.
6. Only the four admixtures, Cal, calcium chloride, Ironite, and trass, appreciably retarded action on normally cured concrete, and these to very limited degrees. Appreciably increased resistance following curing at temperatures of 100 deg. and 155 deg. F. has only been noted in the cylinders containing these admixtures. This suggests the practical possibility of a combination of certain admixtures and moderately high curing temperatures for concrete products to be subjected to the action of sulphate waters.

To Consider Specification for "Clean Coal"

THE AMERICAN STANDARDS Association has received a request from the American Institute of Mining and Metallurgical Engineers to initiate a project for the establishment of standards for "clean bituminous coal."

The question of the initiation of this work will be submitted to the ASA Standards Council at an early date, and if the initiation of the project is approved by the council, this work will be undertaken.

Hints and Helps for Superintendents

Spouts from Belt Conveyors

By C. S. Huntington
Engineer, Link-Belt Co., Chicago, Ill.

IN MOST SAND AND GRAVEL, stone and lime plants, spouts are built from the end of a belt conveyor to screens or other units, merely to carry the material without regard to wear on the spout itself. Attention should be given to make a spout of such shape and location as to give a minimum amount of wear on the spout and at the same time to provide suitable reinforcing or liner plates at the point of greatest wear.

Where possible it is best to provide a "pocket" where the material hits the spout which will fill up with material and form its own wearing surface or liner. In cases where it is not possible to make pockets, it is best to so locate the spout that the material lands with a sliding motion rather than striking the spout squarely.

In locating a spout from a belt conveyor it is first necessary to determine the trajectory or parabolic path taken by the material as it leaves the conveyor head pulley. This path is affected by gravity, the speed of the belt (in feet per minute) and the diameter of the head pulley (in inches).

The formulae involved are somewhat complicated, but by reducing them to chart form the path can be determined with little difficulty.

The vertical scales of the chart are so proportioned in their divisions, and relative locations, that the use of a straight edge will furnish much of the desired data. The right hand scale shows diameters of head pulleys in inches. The inside scale shows velocities of conveyor belts in f. p. m. on one side of the line; and on the other side, a value X, which is of a convenient length to use for dividing the tangent line (explained later) into sections, furnishing division points from which to measure vertical drops in inches (listed in the tabulation at top of chart). The lower ends of these vertical lines are points through which the trajectory curve is to be drawn.

The scale at left is used for finding value of angle B, which measures the arc of contact of the material on the head pulley (starting at the vertical radius DE). Lay straight edge or taut string across the scales at points indicating the diameter of pulley and velocity of belt involved. The extension through left hand scale shows corresponding value of angle B.

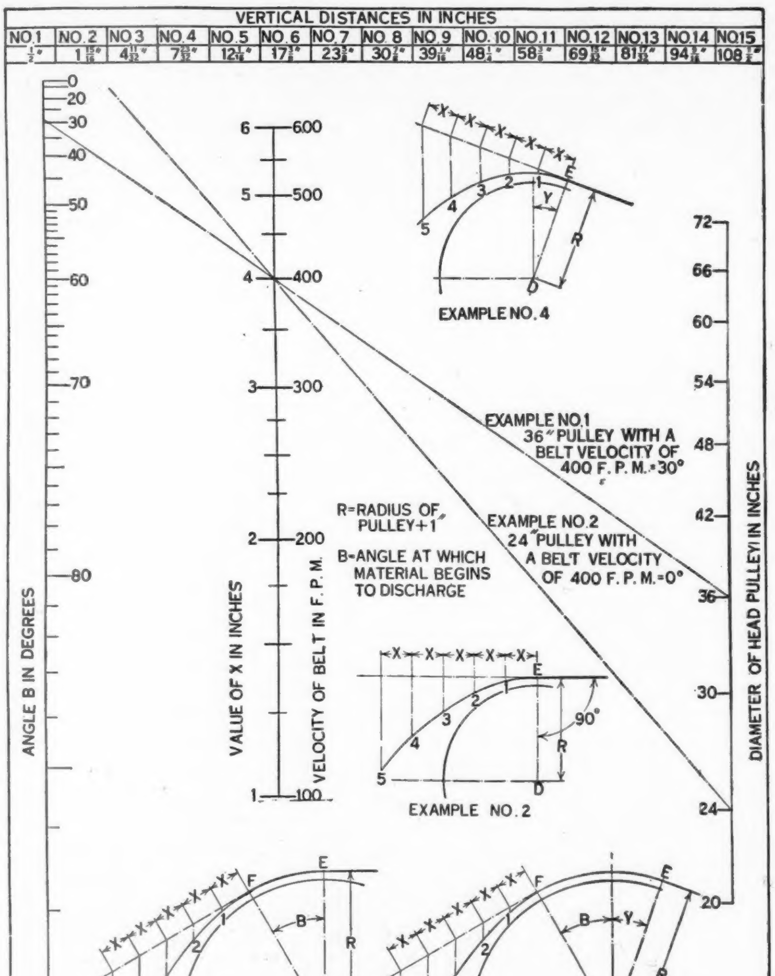


Chart to determine path of travel of material leaving conveyor head pulley

Starting with an imaginary line representing the straight path of the conveyor as it approaches the head pulley, locate a base radius line (DE) at right angles to the conveyor line, letting it equal in length the pulley radius plus 1-in., or radius item R, assumed as the effective distance of the load from center of the pulley.

With radius R, inscribe an outer arc EF, through which the material remains in contact with the belt on the pulley, and draw secondary radius line DF. The angle B is formed by radii DE and DF. At intersection F, draw a tangent line, from which to drop vertical lines to locate the trajectory.

Divide the tangent into sections representing the length of X in each case. From the division points drop vertical lines of lengths given at top of chart; for instance, at end of section No. 1, ½-in.; at No. 2, 1 15/16-in.; at No. 3, 11/32-in., and so on through as many sections as may be required for determining enough of the trajectory to locate the chute properly.

Examples

In Example 1 the conveyor is horizontal, the pulley 36-in. diameter and the belt speed 400 f. p. m. A straight line through 46-in. diameter, and 400 f. p. m. (on the chart), intersects the degree line B at 30 deg. The tangent line is drawn from the intersection (F) of the outside circle made by R, with the line (DF), which indicates the side of angle B.

The tangent line is divided into sections X equaling 4-in. each, and from the division points, lines are dropped vertically to the distances indicated at top of chart, namely, ½-in. for No. 1, 1 15/16-in. for No. 2, 4 11/32-in. for No. 3, and so on through as many points as are necessary to determine the path of the material until it reaches the chute you intend using.

In Example 2, a hori-

zontal conveyor having belt speed 400 f. p. m. and head pulley 24-in. diameter, the line does not indicate any degrees for an angle B, and the material would leave the pulley at its top. The tangent line would be a continuation of the conveyor surfact, counting the effective distance of the load from center of pulley as being 1-in. above the face of the pulley, as previously explained.

Examples 3 and 4 introduced the modifying influence of an inclined instead of horizontal path for the conveyor as it approaches the head pulley, and the effect of the velocity on this item.

To determine whether the load will start to leave the pulley at E or at F, find an indicator figure by the following formula:

$$\text{Indicator figure} = \frac{V^2}{G \times R \times \text{Cos.} Y}$$

Where V = Velocity in feet per second. G = Action of Gravity, or 32.16 ft. per sec. R = Radius "R," measured in feet. Y = Angle of inclination of conveyor. If the indicator figure is less than 1, the trajectory begins at F (Example 3), angle B remaining the same as for a horizontal belt (30 deg. in this case). If the indicator figure is more than 1, the trajectory begins at E, as in Example 4.

In Example 3, using same data as in Example 1, except that the conveyor is inclined 20 deg. (equaling angle Y), the indicator figure from formula is less than 1, and trajectory starts at F (30 deg. to the left from the vertical radius line).

In Example 4, using same data as in Example 2, except for an incline of 20 deg., the result of the formula is greater than 1, and trajectory starts at E, at an angle of 20 deg. to the right from the vertical radius line.

Handling Sand and Gravel from Dredge and Cars in One Operation

A NOVEL INSTALLATION is used at the Waterford Sand and Gravel Co. plant, Waterford, Ontario, to deliver materials to the screening and washing plant. The gravel is dredged and pumped through a 15-in. line to a sump at the plant. This sump also serves as a hopper for car-dumping. A balanced skip hoist does the elevating and conveying to the top of the plant. A railway switch also leads to the sump, which terminates with a car puller. With this arrangement it is possible to unload material for washing and screening from cars, as well as with the delivery by pipe from the dredge. The pipe from the dredge can be seen in the lower left-hand corner.

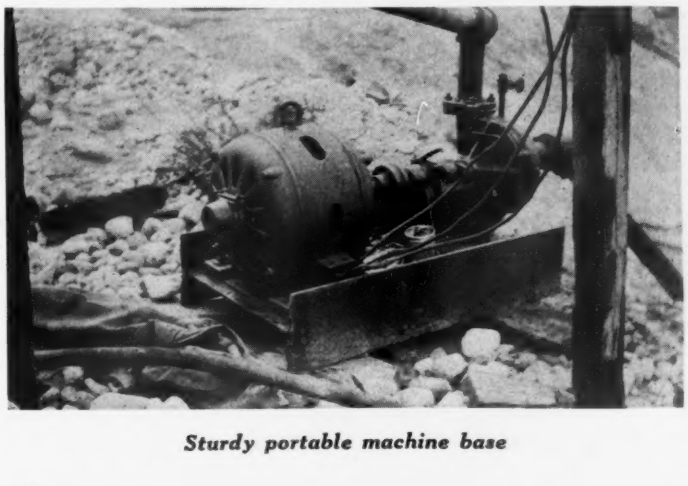
Balanced skip hoist does the elevating

Pump and Motor Base

AN Ohio sand and gravel operator makes use of a short section of heavy "I" beam, as a base for a small booster pump and the small electric motor which drives it.

As shown in the illustration, the motor and pump are permanently bolted to the web of the I-beam section.

This arrangement permits an inexpensive mounting, and at the same time, one that is ideal for semi-permanent and temporary installations. The top and bottom members of the beam act as skids in moving the unit, and it is said that this arrangement permits quick and easy changing of location.

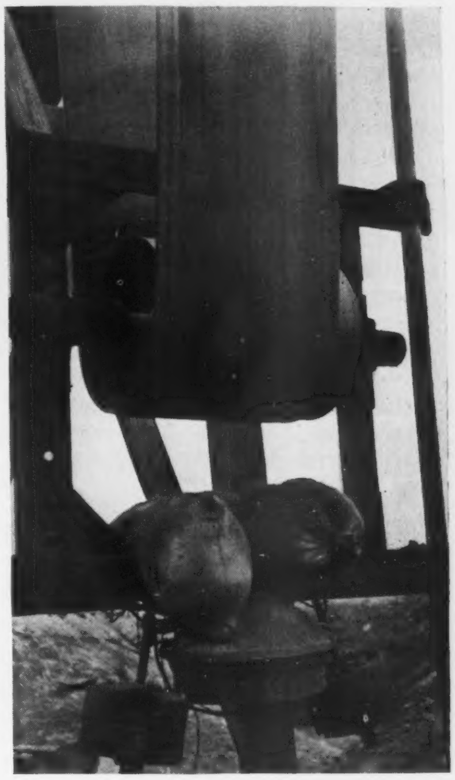


Sturdy portable machine base

Inexpensive Belt-Takeup Weight

THE USE of set cement in cloth sacks, for weights on a conveyor belt takeup, is an inexpensive and easily regulated "kink."

The accompanying illustration shows one such installation. After determining the proper amount of cement to use in the bags, they can either be sprinkled with water, if their location is protected from rain, or if they are located in the open, rain will quickly harden them.



Easily made takeup weight

After hardening, the cement weights will be in place permanently, or until such time as they must be changed. Removal is simple, as the cement sacks will retain their shape until they permanently set.

Rock Products Clinic

Hydraulic Stripping

INQUIRIES frequently come to us in regard to hydraulic stripping of quarries and gravel pits. The files of ROCK PRODUCTS contain descriptions of numerous applications. All the requisite technical information regarding slopes, amount of water required for various materials, yardage, etc., head on nozzles, etc., can be obtained from a book on "Hydraulic Fill Dams," by James D. Schuyler, published some 30 or 40 years ago by John Wiley & Sons, New York City, and obtainable, probably, at most public or engineering society libraries.

This method of excavating and transporting or sluicing material had its origin, we believe, in the placer gold mining operations of California, 50 years ago or more. Any of the large pump manufacturers can doubtless furnish all the information desired in regard to the mechanical equipment and requisites.

As a practical proposition, in stripping a quarry the main thing to be taken care of is the proper disposition of the waste material, so that it does not create a nuisance to adjoining property owners or to owners of riparian rights on any stream into which the material is washed. These conditions, we think, more than mechanical difficulties, have limited the use of hydraulic stripping very materially.

Sieve Testing of Aggregates

I would very much like to secure some copies of the excellent article by Edmund Shaw on "Sieve Testing of Aggregates" in the May 9, 1931, issue of ROCK PRODUCTS in the event that there is any reprint.

Attention is called to some apparent errors in the tables on page 60.

T. E. STANTON,
Materials and Research Engineer,
California Department of Public Works.

* * * * *

The treatise by Edmund Shaw on "Sieve Testing of Aggregates," appearing in ROCK PRODUCTS, May 9, 1931, is an advanced and timely contribution to the knowledge of sieve analysis of aggregates. It appears to me as a distinct landmark in the sea of utter confusion which has existed heretofore in the standards of screen sizes and shapes and in the lack of knowledge of their relative screening effects.

The fineness modulus principle, as a means of proportioning aggregates for concrete, is quite as important as Prof. Abrams considered it to be and, after seven years use and development of the application of the fineness modulus as a means of proportioning, I am convinced that it is one of the fundamental essentials in the proportioning of concrete for uniform results and very much more important than the Portland Cement Association has realized. Consequently, I believe in a uniform ratio of sieve sizes, and, I am inclined to favor the Hoover ratio and sizes.

As a proponent of the metric system as an international standard of weights and measures, for the practical purposes of efficiency and economy as well as the more important one of understanding, I would like to see a new and better standard established as an international one, and based on the metric system, of course.

The confusion in screening standards and plant screen sizes is so great and is causing so many difficulties for aggregate and concrete producers that a new and rational standard would lead the way out of this difficult situation. Mr. Shaw has established an understanding of sieves and screens and the relations of sizes and hole shapes and, thus, has paved the way for a rational international standard.

The sieve analysis chart designed by Mr. Shaw to coordinate the relations of screen sizes, shapes, and effects, is both mathematically and practically correct, in my opinion, and I see it as a new and important aid in the establishment of a concrete technology.

JOSEPH A. KITTS,
San Francisco. Concrete Technologist.

Note: Some of the tabulated figures and decimal points in Mr. Shaw's article are out of place and may be confusing.

Errors Corrected

Mr. Shaw has corrected the article as published as follows:

"In the table on page 60 the last three items under 'nearest U.S.std.' should be:

No. 16	1.19
No. 8	2.38
No. 4	4.76

"I am referring to the tables in the third column. The same sieves and openings in mm. are correctly given in the table in the first column.

"I have read the article through again and find that at the end of the first paragraph in the third column on page 63, should read (last two lines) 'and its curvature is normally least in the center and greatest at the ends.' It is stated just the other way in the article. On page 64, about half way down in the first column, it says, 'It contains fewer sieves than the U. S. scale, (23.28).' The period in the parenthesis should be a colon, making it 23:28."

* * * * *

A limited number of reprints of Mr. Shaw's article (with corrections made) are available for those who would like them.

Praise for Ladoo Articles

"We are of the opinion that these articles on the 'Economics of the Nonmetallic Mineral Industries' by R. B. Ladoo will be very timely and should be of great value to all those who are interested in the subject of nonmetallics. I note that the articles have been copyrighted by the author, all rights reserved. Therefore I am wondering if it is the intention of the author to later publish these articles in book form, or just what the plan is concerning them. If they are not to be published in book form, would it be possible to obtain reprints of the same?"—D. A. LYON, director, Utah Engineering Experiment Station, Salt Lake City, Utah.

* * * * *

"I am very glad to find in the current number of ROCK PRODUCTS the first installment of the article on 'Economics of the Nonmetallic Mineral Industries,' by Mr. Ladoo. I wish to inquire if offprints or separates of the complete article will be available when the serial publication has been completed?"—ARTHUR BEVAN, State Geologist of Virginia.

* * * * *

"I have been reading with interest and profit your series on 'Economics of the Nonmetallic Industries,' and note at the heading of the second of the series that the author, Raymond B. Lado, is also the author of a comprehensive book on the nonmetallic industry.

"I would appreciate your advising me, if you can conveniently do so, where a copy of this book may be obtained, and am enclosing stamped envelope for your reply."—ROBERT H. PATTERSON, manager, Virginia Feldspar Co.

* * * * *

Editor's Reply

We believe it is Mr. Ladoo's intention to rework his current series of articles into book form. We are sure he will be glad to have any criticisms, suggestions and help that readers of this series may offer, in order that he may consider them, and incorporate them in his book, if desirable.

A limited number of reprints of each article is available, and ROCK PRODUCTS will be glad to furnish them to readers who may have any special use to make of them, or who may have missed one or more installments.

The title of Mr. Ladoo's book referred to in our March 28 issue, is "Nonmetallic Minerals (Occurrence, Preparation, Utilization)," published in 1925 by the McGraw-Hill Book Co., 370 Seventh avenue, New York, N. Y.

Editorial Comment

After fiddling around for two years or more with trade practice codes, the Federal Trade Commission has completed its "revision" of some 80 codes which it helped some 80 industrial and business groups to adopt with impressive solemnity at the expense of much money, time and mental energy. The revision is so drastic that the interested industries have abandoned all attempts to obtain satisfaction from the Federal Trade Commission, and hereafter will rely upon the attorney general and his department of justice for relief from unfair competition, where the need of an enforcement agency may be felt. In the rock products industry, the gypsum, the lime, and the crushed stone groups had adopted such codes in co-operation with the Federal Trade Commission. The cement manufacturers have, or at least had, a code without the "benefit" of the Federal Trade Commission.

Disappointed But Not Dismayed

We are sorry that the high hopes of the three groups mentioned, that they would have the help of a strong arm of the government in enforcing decent competition, have been thus rudely dashed to the ground; although we predicted such an outcome long ago, and from the beginning we questioned the necessity or desirability of such government "aid." It is true that holding the trade practice conferences under the auspices of the Federal Trade Commission gave them prestige, and perhaps brought out members of the industry who might have ignored the call of the national associations; but the subsequent devitalizing of these codes—even to the extent of inferred condemnation of business practices of long standing, perhaps first brought to the official attention of the government through these conferences—has certainly done the industries involved more harm than the possible prestige of the conferences did good.

Such trade practice conferences and the drafting and adoption of rules of fair competition have definite educational value. No man can be expected to play the game fairly, if he does not know what the rules of fair play are; or if he does not know that he is using the same code of rules as his competitor. But the trade practice conferences would have had and do have the same educational value whether sponsored by the Federal Trade Commission or by leaders in the industry or association most interested.

We believe the day will come when industrialists will look back and thank Heaven that this flirting with the Federal government turned out as it did. For there is no real logic in asking the Federal government to make us morally and economically sound business men. If we can't make ourselves clean no government under Heaven can do it for us. It was in essence an attempt "to pass the buck" of responsibility, which rests on the shoulders of every single man in business and industry, to the United States government.

Every organized group of business men has power to enforce the rules of fair play in business just as effectively as has the government. For every normal man values above all else the good opinion of his fellow men. The thing every normal man fears most is the censure, condemnation, or ridicule of his fellow man. If men will observe the rules in games of pleasure and in sports, they certainly will observe them in business if the same power of public opinion and the same sense of sportsmanship or sense of decency is inspired and developed.

Proposed Freight Rate Increase

The railway company executives have applied to the Interstate Commerce Commission for a 15% increase in all freight rates and charges. Although a blanket increase of 15% was approved as necessary and has been asked for, it is likely, however, that some commodities will not be able to stand this much of an advance due to the fact that a large part of the traffic would be diverted to motor vehicles. In these cases the roads would make downward adjustments. The net result, if a 15% blanket increase is granted, probably will be an average advance of about 10% after allowance for unchanged rates in some cases.

Before producers protest this proposed increase, if that should be their reaction to the announcement, it would be well to consider the case of the railways from all angles. First the railways normally are, and they should be, among the best customers of rock products producers; second, they are setting a precedent to all business in asking a price for their product (transportation) that should save some of them from bankruptcy. The day is coming when other business will want to raise prices for the same reason, and this precedent should prove valuable. The business press in general is taking the attitude of commending the railway executives for their courage.

Higher freight rates will undoubtedly have a tendency to further localize these rock products industries. We are not so sure that this is not a good thing. A great deal of the present confusion and demoralization in these industries is caused by the needless invasion of one another's rightful sales territory with an enormous waste of cross-hauling, to say nothing of waste of sales efforts and expense. So if higher freight rates would more clearly define sales territories they may not be wholly a handicap to these industries, although they might be a disappointment to the railway executives so far as producing more income is concerned.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	6-15-31	90	95	
Alpha P. C. new com.[2]	6-13-31	10	12	25c qu. Apr. 25
Alpha P. C. pfd.[2]	6-13-31	112	120	1.75 qu. June 15
Amalgamated Phosphate Co. 6's 1936[19]	6-13-31	99	101	
American Aggregates com.[19]	6-13-31	8	15	75c qu. Mar. 1
American Aggregates pfd.[19]	6-13-31	70	75	1.75 qu. Apr. 1
American Aggr. 6's w.w.[19]	6-13-31	60	65	
American Aggr. 6's ex. w.[19]	6-13-31	58	63	
American Brick Co., sand-lime brick	5- 4-31	....	7	25c qu. Feb. 1, '30
American Brick Co. pfd.	5- 4-31	52¼	57	50c qu. May 1, '30
Am. L. & S. 1st 7's[19]	6-13-31	95	98	
American Silica Corp. 6½'s[39]	6-17-31	No market		
Arundel Corp. new com.	6-12-31	36⅜ act. sale		75c qu. Apr. 1
Beaver P. C. 1st 7's[20]	6-12-31	90	93	
Bessemer L. & C. Cl. A[4]	6-12-31	18	20	75c qu. May 1
Bessemer L. & C. 1st 6½'s[4]	6-12-31	....	72	
Bloomington Limestone 6's[27]	6-15-31	45	50	
Boston S. & G. new com.[37]	6-13-31	9	12	30c qu. Apr. 1
Boston S. & G. new 7% pfd.[37]	6-13-31	37	41	87½c qu. Apr. 1
California Art Tile A[9]	6-11-31	....	5	43¾c Mar. 31
California Art Tile B[40]	6-11-31	....	4	20c qu. Mar. 31
Calaveras Cement com.[35]	6-11-31	....	10	
Caleveras Cement 7% pfd.[35]	6-11-31	....	70	1.75 qu. Apr. 15
Canada Cement com.	6-16-31	9⅞	10	
Canada Cement pfd.	6-16-31	90¾	91½	1.62½ qu. June 30
Canada Cement 5½'s[34]	6-15-31	98	....	
Canada Cr. St. Corp. bonds[34]	6-15-31	90	96	
Canada Crushed Stone pfd.[41]	6- 2-31	....	78	
Certainteed Prod. com.	6-16-31	3⅝	4	
Certainteed Prod. pfd.	6-16-31	10	20	1.75 qu. Jan. 1
Cleveland Quarries	6-16-31	....	60	75c qu. June 1
Columbia S. & G. pfd.	6-16-31	92¼	94	
Consol. Cement 1st 6½'s, A[44]	6-17-31	15	25	
Consol. Cement notes, 1941[27]	6-15-31	15	25	
Consol. Cement pfd.[27]	6-15-31	20	30	
Consol. Oka S. & G. 6½'s[12] (Canada)	6-12-31	99	101	
Consol. Rock Prod. com.[9]	6-11-31	50c	75c	
Consol. Rock Prod. pfd.[9]	6-11-31	4½	5	43¾c qu. June1,30
Consol. Rock Prod. units	6-15-31	5	7	
Consol. S. & G. pfd. (Can.)	6-16-31	....	62	1.75 qu. May 15
Construction Mat. com.	6-15-31	6	9	
Construction Mat. pfd.	6-15-31	26¼	27	87½c qu. May 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[35]	6-11-31	65	70	
Coosa P. C. 1st 6's[27]	6-15-31	40	45	
Coplay Cem. Mfg. 1st 6's[33]	6-13-31	95	....	
Coplay Cem. Mfg. com.[33]	6-13-31	5	7½	
Coplay Cem. Mfg. pfd.[33]	6-13-31	25	40	
Dolese & Shepard	6-17-31	44	48	$1 Apr. 1
Dufferin Pav. & Cr. Stone com.	6-16-31	6	7	
Dufferin Pav. & Cr. Stone pfd.	6-16-31	70	76	1.75 Apr. 1
Edison P. C. com.[32]	6-11-31	1½	....	
Edison P. C. pfd.[32]	6-11-31	5	....	
Federal P. C. 6½'s, 1941[19]	6-13-31	96	100	
General Aggr. Corp. 6½'s[38]	5-29-31	97½	98½	
General Aggr. Corp. com.[38]	5-29-31	9	10	25c qu. July 15
Giant P. C. com.[2]	6-13-31	3	7	
Giant P. C. pfd.[2]	6-13-31	15	30	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.	6-16-31	8	9	20c qu. June 30
Hermitage Cement com.[11]	6-13-31	15	25	
Hermitage Cement pfd.[11]	6-13-31	70	80	
Ideal Cement, new com.	6-16-31	32	35	75c qu. July 1
Ideal Cement 5's, 1943	6-10-31	99	101	
Illinois Electric Limestone 1st 7's[38]	5-29-31	95	100	
Indiana Limestone com.[27]	6-15-31	....	3	
Indiana Limestone pfd.[27]	6-15-31	....	50	
Indiana Limestone 6's	6-16-31	34	35¼	
International Cem. com.	6-16-31	31	32½	$1 qu. June 30
International Cem. bonds 5's	6-16-31	85	85⅛	Semi-ann. int.
Iron City S. & G. bonds 6's[38]	5- 2-31	85	....	
Kelley Is. L. & T. new stock	6-16-31	28	30	50c qu. July 1
Ky. Cons. St. V. T. C.[38]	5-29-31	4	5	
Ky. Cons. Stone 6½'s	6-16-31	87	88	
Ky. Cons. Stone com.	6-16-31	....	5½	
Ky. Cons. Stone pfd.	6-16-31	75	85	1.75 qu. May 1
Ky. Rock Asphalt com.[11]	6-13-31	3	4½	40c qu. Oct. 1, '30
Ky. Rock Asphalt pfd.[11]	6-13-31	75	79	1.75 qu. June 1
Ky. Rock Asphalt 6½'s[11]	6-13-31	....	95	
Lawrence P. C.[2]	6-13-31	42	47	$1 qu. June 30
Lawrence P. C. 5½'s, 1942[2]	6-13-31	82	84	
Lehigh P. C.	6-16-31	9¼	10	25c qu. May 1
Lehigh P. C. pfd.	6-16-31	88¼	90	1.75 qu. July 1
Louisville Cement[45]	6-16-31	175	225	
Lyman-Richey 1st 6's, 1932[13]	6-12-31	95	....	
Lyman-Richey 1st 6's, 1935[13]	6-12-31	92	....	
Marblehead Lime 6's[14]	6-12-31	No market		
Marbelite Corp. com. (cement products)	5- 2-31	1	....	
Marbelite Corp. pfd.	6-12-31	1	....	50c qu. Oct.10,'30
Material Service Corp.	6-16-31	18	20½	50c qu. June 1
McCrady-Rodgers 7% pfd.[22]	6-11-31	45	....	87½c qu. June 30
McCrady-Rodgers com.[22]	6-11-31	15	20	75c qu. Jan. 26
Medusa Portland Cement[27]	6-15-31	40	50	75c qu. Apr. 1
Michigan L. & C. com.[6]	5-29-31	45	....	
Missouri P. C.	6-16-31	21¼	22	50c qu. July 31
Monolith Portland Midwest[9]	6-11-31	1	1½	
Monolith P. C. com.[9]	6-11-31	1	2	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	6-11-31	2	3	40c s.-a. Jan. 1
Monolith P. C. units[9]	6-11-31	5	7	
Monolith P. C. 1st Mtg. 6's[9]	6-11-31	73	77	
National Cem. (Can.) 1st 7's[34]	6-15-31	99	....	
National Gypsum A com.	6-15-31	4	5	
National Gypsum pfd.	6-15-31	40	43	$1 Apr. 1
Nazareth Cement com.[25]	6-11-31	10	12	
Nazareth Cement pfd.[25]	6-11-31	80	85	
Newaygo P. C. 1st 6½'s[27]	6-15-31	98	100	
New England Lime 6's, 1935[19]	6-13-31	40	60	
N. Y. Trap Rock 1st 6's	6-16-31	93¼	....	
N. Y. Trap Rock 7% pfd.[30]	6-16-31	95	....	1.75 qu. July 1
North Amer. Cem. 1st 6½'s	6-15-31	31½ act. sale		
North Amer. Cem. com[27]	6-15-31	1	2	
North Amer. Cem. 7% pfd.[27]	6-15-31	8	11	
North Shore Mat. 1st 5's[15]	6-17-31	90	....	
Northwestern States P. C.[31]	6-15-31	100	....	$2 Apr. 1
Ohio River Sand com.	6-16-31	....	14	
Ohio River Sand 7% pfd.	6-16-31	....	98	
Ohio River S. & G. 6's[16]	6-13-31	80	85	
Oregon P. C. com.[9]	6-11-31	8	12	
Oregon P. C. pfd.[9]	6-11-31	80	85	
Pacific Coast Aggr. com.[40]	6-11-31	....	1	
Pacific Coast Aggregates pfd.	6-15-31	1	2	
Pacific Coast Cement 6's[5]	6-12-31	64½	74½	
Pacific P. C. com.[5]	6-12-31	14¾	17¾	
Pacific P. C. pfd.[5]	6-12-31	58¼	74½	1.62½ qu. Apr. 1
Pacific P. C. 6's[5]	6-12-31	97¼	97¾	
Peerless Cement com.[1]	6-13-31	1½	2¼	
Peerless Cement pfd.[1]	6-13-31	35	43	1.75 qu. Apr. 1
Penn.-Dixie Cement com.	6-16-31	2⅛	3	
Penn.-Dixie Cement pfd.	6-16-31	10⅛	13	
Penn.-Dixie Cement 6's	6-15-31	54 act. sale		
Penn. Glass Sand Corp. 6's	6- 3-31	100	102	
Penn. Glass Sand Corp. pfd.	5- 6-31	90	....	1.75 qu. July 1
Petoskey P. C.	6-16-31	5	6	15c qu. Apr. 1
Port Stockton Cem. com.[9]	6-11-31	No market		
Riverside Cement com.	6-12-31	....	13	
Riverside Cement pfd.[20]	6-12-31	59	61	1.50 qu. May 1
Riverside Cement, A[20]	6-12-31	....	15	15c qu. Feb. 1
Riverside Cement, B[20]	6-12-31	75c	1	
Roquemore Gravel 6½'s[17]	6-12-31	98	100	
Sandusky Cement 6½'s, 1931-37[19]	6-13-31	90	100	
Santa Cruz P. C. com.	6-12-31	84	....	$1 qu. Apr. 1
Schumacher Wallboard com.	6-12-31	6⅛	11	25c qu. June 27
Schumacher Wallboard pfd.	6-12-31	....	20	50c qu. May 15
Southwestern P. C. units[35]	6-11-31	240	....	
Standard Paving & Mat. (Canada) com.	6-16-31	7¾	8	50c qu. May 15
Standard Paving & Mat. pfd.	6-16-31	....	69⅞	1.75 qu. May 15
Superior P. C., A[20]	6-12-31	35½	36	27½c mo. July 1
Superior P.C., B[20]	6-12-31	10¼	11	25c qu. Mar. 20
Trinity P. C. units[31]	6-15-31	105	115	
Trinity P. C. com.[31]	6-15-31	30	....	
Trinity P. C. pfd.[27]	6-15-30	90	....	
U. S. Gypsum com.	6-15-31	35	35½	40c qu. June 30
U. S. Gypsum pfd.	6-15-31	128¼	130	1.75 qu. June 30
Wabash P. C.[21]	6-13-31	....	22	
Warner Co. com.[16]	6-13-31	21	22½	25c qu. July 15
Warner Co. 1st 7% pfd.[16]	6-13-31	94	96	1.75 qu. July 1
Warner Co. 1st 6's[8]	6-18-31	88	91	
Whitehall Cem. Mfg. com.[30]	6-16-31	80	....	
Whitehall Cem. Mfg. pfd.[30]	6-16-31	50	....	
Wisconsin L. & C. 1st 6's[15]	6-17-31	90	....	
Wolverine P. C. com.	6-15-31	2	2⅝	15c qu. Nov. 15
Yosemite P. C., A com.[9]	6-11-31	....	10	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Beadling & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]A. B. Leach & Co., Inc., Chicago, Ill. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher & Co., Denver, Colo. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomas & Co., Montreal. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky.

Illinois Electric Limestone Bond Issue

E. W. HAYS AND CO., Inc., bankers, Louisville, Ky., are offering $500,000 first mortgage and leasehold sinking fund 7% gold bonds of the Illinois Electric Limestone Co., East St. Louis, Ill. The total authorized issue is $500,000. The bonds are dated January 1, 1931, due January 1, 1941, and bear interest semi-annually, January 1 and July 1. They are in denominations of $100, $500 and $1000. The trustee is the United States Corporation Co.

The bonds are callable as a whole or in part on any interest date on 30 days' notice at 105 to January 1, 1936 inclusive and at 1% less each year thereafter. Bonds may also be retired for the sinking fund.

The sinking fund is payable semi-annually of $35,000 per annum beginning January 1, 1931-1936 inclusive and $55,000 per annum thereafter, sufficient to retire $450,000 bonds by maturity.

SECURITY—A direct first mortgage on entire plant and equipment owned in fee and the fee of the limestone quarry when acquired and a first lien upon all rights, interests and leaseholds to property now owned.

PURPOSE—Issued to complete the development of St. David property and to insure acquisition of the fee title to rock quarry now under lease. The bonds will be listed on the Louisville Stock Exchange.

TAX STATUS—The Pennsylvania, Connecticut and California 4 mills, Maryland 4½ mills and Kentucky 5 mills taxes and Massachusetts and Tennessee not exceeding 6% income taxes refunded. Company pays normal income tax up to 2%.

CAPITALIZATION

	Authorized	Outstanding
First and leasehold 7s, 1941	$500,000	$500,000
	Shares	Shares
Common, no par	*200.000	200,000

*Transfer agent: National City Bank, New York.

NET EARNINGS—After Federal income tax, but before depreciation and depletion, were: Fiscal year to May 31, 1930, $115,764; 6 months to November 30, 1930, $61,330.

PRO FORMA BALANCE SHEET, AS OF JANUARY 1, 1931 (GIVING EFECT TO PRESENT FINANCING)

ASSETS	
*Property and equipment	$ 565,462
Current assets:	
Cash	401,505
Accounts receivable	51,230
Freight claims receivable	2,300
Inventories	42,555
Deferred charges	98,943
Total	$1,161,995
LIABILITIES	
†Capital stock	$ 548,090
Bonded debt	500,000
Current liabilities:	
Notes payable	37,859
Accounts payable	30,634
Accruals	15,838
Purchase money notes due	29,574
Total	$1,161,995
Current assets	$ 497,590
Current liabilities	84,331
Working capital	$ 413,259

*After depreciation and depletion of $132,708.
†Represented by 200,000 no par shares.

Big Block of Wellston Iron Furnace (Superior Cement) Stock Changes Hands

FOUR THOUSAND THREE HUNDRED AND TWENTY-SIX shares of Wellston Iron Furnace Co. stock were sold on the floor of the Cincinnati Stock Exchange recently. The stock was offered by the Irwin Ballman Co., brokers, "for account of whom it may concern" but the brokerage concern refused to divulge for whom the stock was sold and the purchasers refused to make known for whom the stock was bought.

The sale included 1436 shares Wellston Iron Furnace Co. first preferred, 1000 shares of Wellston Iron Furnace Co. second preferred and 1890 shares of Wellston common. —*Ironton* (Ohio) *Tribune.*

Riverside Cement Preferred Dividends Paid

THE Riverside Cement Co., Los Angeles, Calif., corrects the news item in ROCK PRODUCTS, June 6, to the effect that the company had deferred its preferred dividend. The directors of the Riverside Cement Co. declared and paid its usual quarterly dividend of $1.50 per share on preferred stock on May 1, but voted to omit the quarterly dividend on Class A, no-par value, stock.

Alpha Cement Sells Coal Properties

ON JUNE 11, 1931, it was reported that the Alpha Portland Cement Co., Easton, Penn., had disposed of its Phoenix coal mining property near Wolf Summit, W. Va., to the Empire Fuel Co., of Fairmont. The property sold includes unmined coal under 521 acres, 13 acres surface land and leasehold on 107 acres surface land, as well as mining machinery and equipment.

Lehigh Cement Omits Common Dividend

LEHIGH PORTLAND CEMENT CO., Allentown, Penn., has omitted the quarterly dividend of 25 cents on the common stock, due August 1.

Recent Dividends Announced

Gypsum, Lime and Alabastine (Can.) (qu.)	$0.20,	June 30
Ideal Cement com. (qu.)	0.75,	July 1
Kelley Island Lime and Trans. (qu.)	0.50,	July 1
Missouri Portland Cement (qu.)	0.50,	July 31
New York Trap Rock pfd. (qu.)	1.75,	July 1
Pennsylvania Glass Sand pfd. (qu.)	1.75,	July 1
Schumacher Wall Board com. (qu.)	0.25,	June 27
Superior Portland Cement Class A (mo.)	0.27½,	July 1

Ideal Pays Regular Dividend

DIRECTORS of Ideal Cement Co., Denver, Colo., on June 10, declared the regular quarterly dividend of 75 c. a share on common stock and thereby assured the distribution of $343,703.25 to stockholders of the company on July 1.

The dividend is payable to stock of record June 15.

When the directors acted they brought the amount of money to be paid out to bond and stockholders on July 1 to $447,353.25, as that day is the interest date for the company's debentures on which $103,650 interest will be disbursed.

Officers reported that the company was in an excellent cash position and directors were told that the book value of the common stock is around $50 a share.—*Denver* (Colo.) *Post.*

Florida Portland Cement Co. Statement

THE BALANCE SHEET of the Florida Portland Cement Co., Tampa, Fla., is reported as follows, as of December 31:

ASSETS	1930	1929
Property and equipment	$5,101,683	$5,081,851
Organization expenses	691,884	691,884
Current assets:		
Inventories	328,693	314,929
Cash	221,427	170,377
Sundry receivable, etc.	262,520	162,507
Investments	7,182	7,532
Deferred charges	67,287	96,040
Total	$6,680,676	$6,525,120
LIABILITIES		
Preferred stock	$4,997,100	$4,997,100
*Common stock	1,100	1,100
Bonded debt	1,565,000	1,641,000
Current liabilities:		
Accounts payable, etc.	48,625	70,030
Depreciation and depletion reserve	454,317	319,810
Deficit	385,466	503,921
Total	$6,680,676	$6,525,120
Current assets	$812,640	$647,813
Current liabilities	48,625	70,030
Working capital	$764,015	$577,783

*Represented by 75,000 no par shares.

Bonds Called

THE American Agricultural Chemical Co. directors have voted to call outstanding 7½% mortgage bonds totaling $5,442,500. The bonds will be paid August 1 at the redemption price of $102.50. This will leave the company without any funded debt or preferred stock.

* * * * *

The Pennsylvania Glass Sand Corp. has called a total of $58,000 first mortgage 6% sinking fund bonds due July 1, 1952, for payment July 1 next at 105 and interest at Brown Bros., Harriman and Co., New York, Philadelphia and Boston.

Arundel Corp. Earnings

THE Arundel Corp., Baltimore, Md., sand and gravel producer and dredging contractor, reports April earnings of $239,985 against $234,309 for April, 1930.

Yosemite Portland Cement Corp. Annual Report

"THE YEAR of 1930 throughout the United States was one of continued business decline, closing in new low levels in consumption and prices in practically all lines of industrial and agricultural products. Such a period of depression always results in an endeavor by all lines of business to maintain competitive positions by increased sales effort and by reductions in operating and production costs." So reads the preliminary remarks of the annual report of the president of the Yosemite Portland Cement Corp., A. Emory Wishon, to his stockholders.

Sales Above California Average

The record of the corporation in its third complete year of operation indicates that, while feeling the full effect of this general economic and industrial depression, the corporation has successfully maintained sales slightly above the California average, reduced production cost, maintained the quality of the product and the condition of the plant, set aside substantial reserve for depletion and depreciation, and finished the year with an addition to surplus.

Comparison of barrels output, gross income and net income figures for 1930 and 1929 are at first glance disappointing, says the report. But when compared with similar ones for the cement industry of California as a whole, and with various other lines of allied business throughout the state for the same period, the company feels that it is weathering the storm in a rather substantial way.

SALES—Total sales for the year of 1930 amounted to 498,509 bbl., as compared with 601,174 bbl. for 1929, a decrease of 17%. Total cement consumed in California for 1930 as compared with 1929 shows a decrease of 19.8%.

The average selling value per barrel of cement was approximately $1.77 for 1930, as compared with $1.93 for 1929, or a decrease of 16 c. per bbl.

The principal reason for the decrease in price was the change on May 15, 1930, from a 10 c. dealer commission and 10% cash discount to a 20 c. dealer commission and 2% discount.

Production Cost Reduced

The production cost per barrel in 1930 was reduced 6.5% in spite of the smaller output. This partially offset the decreased selling price. Total administrative expenses were reduced 21%. Selling expenses increased 8% as a consequence of additional sales effort.

CURRENT ASSETS—Total current assets as of December 31, 1930, amounted to $640,511.07, an increase during the year of $72,881.49. Cash on hand or on deposit in banks increased $70,178.66 and inventories of materials, supplies, and cement on hand increased $46,848.79. Notes receivable increased $5,251.52. Partially offsetting these increases was a decrease in securities owned of $12,937.87, resulting from converting part of this account to cash, and a decrease in accounts receivable of $36,459.61.

Good Ratio of Assets to Liabilities

CURRENT LIABILITIES—Current liabilities, consisting entirely of current running expenses and provision for Federal income tax on the year's operations, amounted to $74,500.18, a decrease of $44,697.15. Current assets were more than eight and one-half times current liabilities, compared to four and three-quarter times last year, which was pointed to as a particularly good situation. The policy has been to keep the corporation in a strong current position. This is necessary if any improvements in manufacturing processes or new marketing opportunities are to be utilized without delay.

RESERVES—At the close of the year, reserves for depreciation and depletion totaled $241,294.62, an increase of $84,005.80, and now equal 13% of the plant and quarry property value. Reserve for doubtful accounts amounted to $9,142.50, the basis of accrual having been increased from one-fourth of 1% to one-half of 1% of revenue.

SURPLUS—The earned surplus as of December 31, 1930, was $246,402.30, compared to $187,633.23 on December 31, 1929, an increase of $58,769.07.

PROPERTY—The value of the mill, the clay and rock deposits, and the equipment in the corporation's offices, together with the sum of $367,714.81 which represents the cost of organization, was $2,216,313.15 at the close of the year. All property was maintained in the best of condition during the year with adequate reserves as already described.

Cement Improved

TECHNICAL DEVELOPMENTS—During the year our chemists further improved "Yosemite oil field cement," which has been on the market with "Yosemite standard cement," and in addition developed "Yosemite one-day cement" for commercial production. This cement, which is believed to be fully protected by patents applied for, develops 28-day strength in *one* day. The corporation has been working on the development of this cement for more than two years. Research is a form of insurance, says the report; it is insurance against industrial progress of competitors. The following philosophical remarks are added: "No business remains stationary. It either goes forward or slips backward. We are bending every effort to make your corporation go forward. 'Yosemite one-day' is one example of our efforts. We hope that an increasing market will be developed as the advantages of a quick-setting, high-early-strength cement at reasonable price and without excessive setting temperature is more widely appreciated."

Kelley Island Lime on $2 Dividend Basis

THE Kelley Island Lime and Transport Co., Cleveland, Ohio, has declared a quarterly dividend of 50 c., placing the stock on a $2 annual basis, against $2.50 previously. Dividend is payable July 1 to stock of record June 20.

BALANCE SHEET OF THE YOSEMITE PORTLAND CEMENT CORP., AS OF DECEMBER 31, 1930

ASSETS

Fixed capital:		
Plant property	$1,848,598.34	
Less reserves for depreciation and depletion	241,294.62	
Remainder	$1,607,303.72	
Organization expenses	367,714.81	
Total fixed capital		$1,975,018.53
Current assets:		
Cash	$ 152,032.18	
Securities, at cost	26,116.66	
Notes receivable	35,375.57	
Accounts receivable	171,863.22	
Inventories (based on physical inventories and book values; not verified as to quantities)	255,123.44	
Total current assets		640,511.07
Deferred charges:		
Class B common capital stock issued to organizers	$1,408,000.00	
Other deferred charges	62,415.38	
Total deferred charges		1,470,415.38
Total		$4,085,944.98

LIABILITIES

Capital stock:		
Class A 8% cumulative and participating common capital stock (authorized, 250,000 shares of $10 each; outstanding, 234,790 shares)	$2,347,900.00	
Class B common capital stock (authorized, 150,000 shares of $10 each; outstanding, 140,800 shares)	1,408,000.00	
Total capital stock		$3,755,900.00
Current liabilities:		
Accounts payable	$ 61,894.00	
Federal income and state franchise taxes	8,606.18	
Customers' sack redemption account	4,000.00	
Total current liabilities		74,500.18
Reserve for doubtful notes and accounts		9,142.50
Surplus		246,402.30
Total		$4,085,944.98

Note: No dividends have been paid on Class A or Class B common capital stock.

Provisional Program of the 34th Annual Meeting of the A. S. T. M.

THAT PART of the provisional program of the 34th annual meeting of the American Society for Testing Materials to be held in Chicago, Ill., June 22-26 of interest to the rock products industry is as follows:

June 25—9:30 A. M.

SYMPOSIUM ON WEATHERING CHARACTERISTICS OF MASONRY MATERIALS

Papers to be read are "Economic Aspects of Masonry Decay from Weathering Effects," by H. S. Brightly; "Weathering of Concrete," by E. Viens; "The Weathering of Structural Clay Products," by J. W. McBurney; "Weathering of Stone and Slate," by G. F. Loughlin and C. H. Behre; "Weathering of Aggregates," by L. O. Hanson; "Weathering Test Procedures for Various Masonry Materials," by F. H. Jackson, H. D. Foster and D. W. Kessler; "Bibliography and Abstracts on Weathering of Masonry," by F. O. Anderegg, F. R. McMillan, D. E. Parsons and D. W. Kessler.

8:00 P. M.

THE ECONOMIC SIGNIFICANCE OF SPECIFICATIONS FOR MATERIALS

Papers to be read at this session are "The Use of Specifications from the Point of View of a Producer of Concrete," by J. P. H. Perry; "The Use of Specifications for Concrete from the Consumer Viewpoint," by A. R. Lord, and "Specifications from the Standpoint of a Large Purchaser of Engineering and Special Materials," by J. W. Bancher.

June 26—9:30 A. M.

MASONRY BUILDING MATERIALS, REFRACTORIES

Reports and papers to be read are: report of committee C-8, on refractories, by G. A. Bole, chairman; report of committee C-10, on hollow masonry building units by D. E. Parsons, chairman; "Specifications for Hollow Masonry Building Units," by D. E. Parsons; "Tests on the Stability of Concrete Masonry Walls," by F. E. Richart, P. M. Woodworth, and R. B. Moorman; "Fire Resistance and Stability of Walls of Concrete Masonry Units," by C. A. Menzel; report of committee D-16, on slate, by W. B. Plank, chairman, and report of committee D-18, on natural building stones, by F. Y. Joannes, chairman.

2:00 P. M.

CEMENT AND CONCRETE, LIME GYPSUM

Papers to be read at this session are: report of committee C-7, on lime, by H. C. Berry, chairman; report of committee C-11, on gypsum, by J. W. Ginder, chairman; report of committee C-1, on cement, by P. H. Bates, chairman; "Should Standard Cement Specifications Permit Inter-Grinding Siliceous Admixtures at the Mill," by W. C. Bruce; "Crystalline Talc as an Admixture in Concrete," by F. R Wicks, and "The Concrete Flow Trough," by D. M. Burmister.

8:00 P. M.

CONCRETE

Committee reports and papers to be read are: report of committee C-9, on concrete and concrete aggregates, by Cloyd M. Chapman, chairman; "Accelerated Freezing and Thawing as a Quality Test for Concrete Aggregates," by F. C. Lang and C. A. Hughes; "Relation of Coarse Aggregate Content to the Quality of Paving Concrete," by F. H. Jackson and W. F. Kellerman; report of Society's representatives on joint committee on Standard Specifications for Concrete and Reinforced Concrete, by Cloyd M. Chapman, chairman; "Tests of Concrete Conveyed from a Central Mixing Plant," by W. A. Slater; "Effect of Curing Temperatures upon the Strength of Mass Concrete," by R. E. Davis and G. E. Troxell, and "The Effect of Time Loading upon the Bond Stress between Concrete and Steel," by R. L. Brown.

Entertainment, too

In addition to the business sessions special features for entertainment of visitors have been arranged. Wednesday evening there will be a special dinner, dance and smoker. Thursday afternoon a golf tournament will be held at the Glen Oaks country club. A number of prizes will be awarded. A tennis tournament will also be held Thursday afternoon. Finals will be played off Friday afternoon. Prizes for the winner and runner-up of the tournament will be awarded. A sight-seeing tour has been arranged at 2:00 P. M. Thursday for those who wish to see the many interesting things about Chicago. The ladies have not been forgotten in these arrangements and will be entertained by the Ladies' reception committee.

Patent Decision on Asphaltic Mix Name

THE TERM "lithic" as applied to paving material in a trade-marked name has the same meaning as the word "mix," it is held in the office of the United States Commissioner of Patents. Therefore an order has been made that a San Antonio, Tex., manufacturer, R. L. White, is not entitled to register the term "Valdemix" as a trademark for asphaltic or bituminous material.

The opposer to White's application was the Uvalde Construction Co. of Texas, which trade-marks its asphaltic or bituminous paving materials under the term "Valdilithic."

Assistant Commissioner Moore, who handed down the decision, stated that use of the two terms likely would cause confusion in the mind of the public as to the origin or ownership of the materials.

Gypsum in 1931

THE FOLLOWING TABLE, prepared by the United States Bureau of Mines, Department of Commerce shows quarterly production, imports, and sales of gypsum and gypsum products in the United States.

QUARTERLY PRODUCTION, IMPORTS AND SALES OF GYPSUM AND GYPSUM PRODUCTS IN THE UNITED STATES AS REPORTED BY OPERATORS

	First quarter
Number of operators reporting	33
Crude gypsum mined	545,018*
Crude gypsum imported (as reported by importers)	(a)
Crude gypsum sold (domestic and imported)	126,543*
Calcined gypsum produced from domestic and imported rock	444,116*
Calcined gypsum products sold from domestic and imported rock:	
For pottery, terra cotta, plate glass, mixing plants, etc.	54,921*
Keenes cement	7,894*
Neat, wood fiber, sanded, gaging, finish plasters, etc.	302,237*
Wall board	88,569,846†
Plaster board and lath	53,873,521†
Partition tile	6,052,441†
Roof tile	(a)
Other tile	(a)
Other calcined gypsum sold	3,427*

(a) Less than three operators reporting.
*Short tons.
†Sq. ft.

1932 Road Show in Detroit

THE 29TH ANNUAL convention and Road Show of the American Road Builders' Association will be held in Detroit, Mich., January 9 to 15, 1932.

The Detroit Airport building will be used for both the convention and the road show. All exhibit space is on the ground floor.

A new plan of housing delegates will be followed this year. An effort will be made to house all road builders whose interests are alike in the same hotel, city people in one hotel, county in another, and so on through the list. It is believed this plan will facilitate locating people at their hotels.

All convention meetings will be held on the second floor of the Airport building.

New England Quarantine Regulations Revised

THE REVISED REGULATIONS of the gipsy moth and brown-tail moth quarantine modify the restrictions on the shipment of stone and quarry products, as well as other products of this area from the areas infested with the gipsy moth and brown-tail moth in the New England states. The revision was effective June 1.

The regulations as a whole have been rearranged somewhat to conform with the plan now in use under other domestic quarantines and to describe more accurately present practice in the administration of the quarantine. No change is made in the boundaries of the regulated areas.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

	Limestone Flux Week ended		Sand, Stone and Gravel Week ended	
District	May 16	May 23	May 16	May 23
Eastern	1,974	2,261	6,820	8,124
Allegheny	1,733	1,779	4,218	4,610
Pocahontas	571	375	1,144	1,350
Southern	970	1,008	8,048	9,051
Northwestern	729	844	5,390	6,109
Central Western	320	311	8,929	9,604
Southwestern	655	624	6,540	6,110
Total	6,952	7,202	41,089	44,958

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1930 AND 1931

	Limestone Flux		Sand, Stone and Gravel	
	1930	1931	1930	1931
	Period to date		Period to date	
District	May 24	May 23	May 24	May 23
Eastern	52,517	31,817	92,704	55,661
Allegheny	51,587	33,861	87,199	49,538
Pocahontas	7,079	4,844	17,947	15,257
Southern	13,839	13,147	145,414	138,126
Northwestern	15,787	11,022	54,174	43,075
Central Western	10,014	7,881	160,256	102,125
Southwestern	8,507	5,710	111,554	88,960
Total	159,330	108,282	669,248	492,742

COMPARATIVE TOTAL LOADINGS, 1930 AND 1931

	1930	*1931*
Limestone flux	***159,330***	***108,282***
Sand, stone, gravel	***669,248***	***492,742***

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of June 13:

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

22903. **Common sand and screened or crushed gravel,** minimum weight 50 net tons, from Westboro, N. H., to Branklin and Halcyon, N. H. Present—Common sand, 80c; screened or crushed gravel, 90c. Proposed—60c per net ton; common sand, 70c per net ton, screened or crushed gravel. Reason—To meet motor truck competition.

22937. **Stone, broken or crushed,** in bulk, in gondola or other open top cars (See Note 3), from West Quincy, Mass., to Norton and Mansfield, Mass. Proposed, 55c; present, 90c per net ton. Reason—To meet motor truck competition.

22942 (1A). To cancel commodity rate of 14c on **crude feldspar,** from Rumney, N. H., to Keene, N. H., published in B. & M. R. R., I. C. C. A-2707 and apply in lieu thereof present sixth class rate of 19½c, published in B. & M. R. R., I. C. C. A-2540. Reason—To cancel obsolete commodity rate.

TRUNK LINE ASSOCIATION DOCKET

26731. **Engine sand,** carloads, in open top equipment (See Ncte 2), from Hancock, Great Cacapon and Berkeley Springs, W. Va., to Snider, W. Va., $1.50.

27099. **Sand and gravel, common,** carloads (See Note 2), from Pierce, W. Va., to Spring Gap, Md., $1.10 per net ton. (Present rate $1.30.) (See Note 4.)

26636. **Ground limestone,** carloads, minimum weight 60,000 lb., and **unburnt or pulverized limestone,** carloads, minimum weight 60,000 lb., from B. & O. R. R. producing points, Frederick, Grove, Security, Md., Martinsburg, Millville, Engle, W. Va., Stephens City, Strasburg Junction and Strasburg, Va., to Coal Junction, Bell and Gray, Penn., $1.80; Deal and Warrens Mill, Penn., $1.60; Sand Patch, Keystone, Meyersdale, Black, Garrett, Swanson, Rockwood Junction, Rockwood and Casselman, Penn., $1.70. Rates in cents per net ton.

27112. **Crushed or ground slate,** carloads (See Note 2), from Cardiff, Md., Delta, Slate Hill, Penn., and Whiteford, Md., to Baltimore, Md., 7½c per 100 lb. (Present rate, 10c, minimum carload weight 50,000 lb.) (See Note 4.)

27113. **Lime, land,** carloads, minimum weight 30,000 lb., from Annville, Meyerstown, Palmyra and Swatara, Penn., to Pennhurst, Penn., 14c per 100 lb. (Present rate, 19c, sixth class.) Reason—Proposed rate is comparable with rates from Annville and Myerstown, Penn., to Swedeland, Penn.

26472. **Limestone, crude fluxing, foundry and furnace,** when shipped in open top equipment, carloads (See Note 2), from Pinesburg, Cavetown, Charlton, Nessle, W. Va., Bittinger, Thomasville and York, Penn., to Follansbee, W. Va., Midland, Penn., Steubensville, Toronto, O., Weirton, W. Va., $1.69, and Portsmouth, O., $3.02 per gross ton.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

27117. **Sand,** carloads (See Note 2), from South Pemberton and Birmingham, N. J., to Ship Botton (Beach Arlington), N. J., $1 per net ton. Rate to expire November 30, 1931. (Present rate, $1.27.) Reason—To meet motor truck competition.

Sup. to 26899. Amend Rate Proposal No. 26899, covering **lime and limestone,** carloads, from Cavetown-Pinesburg and Thomasville-Bittinger districts to Reading Co. stations on the Bloomsburg Branch, Paper Mill to Benton, Penn., and make the following changes: From Cavetown-Pinesburg district, under Note 3, change rate from 13½c to 15½c; from Thomasville-Bittinger district, under Note 3, change rate from 13½c to 14½c.

27134. **Sand, common or building** (not blast engine, fire, foundry, glass, molding or silica sand), **and gravel,** carloads, in shipping containers loaded on container cars; **stone, natural** (other than bituminous asphalt rock); **crushed,** carloads, in shipping containers loaded on container cars, minimum weight 110,000 lb., from South Bethlehem, N. Y., to Coxsackie, N. Y., and West Athens, N. Y., 60c per net ton. (Present rate, 9c per 100 lb.) Reason—To meet motor truck competition.

27135. **Crushed stone,** carloads (See Note 2), from Martinsburg, W. Va., to Cumberland, Md., $1 per net ton. (Present rate, $1.15.) Reason—Proposed rate is comparable with rate from Security and Cavetown, Md.

27136. To cancel commodity rates on **stone, crushed,** carloads (See Note 2), from Pattersonville, South Little Falls and Canajoharie, N. Y., to points on the D. & H. R. R. Classification basis to apply. Reason—Investigation develops no traffic has moved for some time, nor is there prospects for future shipments, therefore rates are obsolete.

27137. To cancel from P. R. R. G. O. I. C. C. No. 14779 commodity rate of $1.45 per net ton on **crushed stone, coated with oil, tar or asphaltum,** carloads, from Martinsburg, W. Va., to Gettysburg, Penn. Reason—Investigation develops no traffic has moved for some time, nor is there prospects for future shipments, therefore rate is obsolete.

27138. **Stone, natural** (other than bituminous asphalt rock); **crushed,** carloads (See Note 2), from Le Roy, N. Y., to Niles Valley, Wellsboro Junction, Wellsboro, Brownlee and Antrim, Penn., $1.85 per net ton. (Present rate, $1.95.) Reason—Proposed rate is comparable with rates from Le Roy, N. Y., to Morris and Hoytville, Penn.

27144. **Crushed stone and screenings,** carloads (See Note 2), from Billmeyer, Union Stone Co. and Bainbridge, Penn., to Bacons, Del., $1.60 per net ton. Present rate, $1.75. (See Note 4.)

27173. **Spent or refuse grinding sand,** carloads (See Note 2), from Butler, Penn., to Donora, Penn., 90c per net ton in open top equipment and $1.04 per net ton in box cars, and to Titusville, Penn., $1.20 per net ton in open top equipment and $1.38 per net ton in box cars. (See Note 4.)

27175. **Sand, other than blast, engine, foundry, molding, glass, silica, quartz or silex,** carloads (See Note 2), from Dover, Del., to Hartley, Del., 80c per net ton. (Present rate, $1.25 per net ton.) (See Note 4.)

27176. **Gravel and sand** (other than blast, core, engine, fire, foundry, glass, molding, quartz, silex or silica), in straight or mixed carloads (See Note 2), etc., from Machias, N. Y., to Marilla, N. Y., $1.10 per net ton. (Present rate, $1.20.) Reason—Proposed rate is comparable with rate from Machias, N. Y., to Depew, Lancaster, Hamburg, N. Y., etc.

27185. (B) **Agricultural and land lime,** carloads, minimum weight 30,000 lb.; (D) **ground limestone,** minimum weight 50,000 lb. From Ashcom, Penn.

To	Prop. rate (B)	(D)
Erie Junction to Paynesville, N. Y.	16	16
Genesee to Shingle House, Penn.	16	....

Rates in cents per 100 lb. Reason—Proposed rates from Bainbridge, Penn., to Nichols and Wellsville, N. Y.

Sup. 1 to 26990. (A) **Lime, building,** carloads; (B) **lime, agricultural and land,** carloads; (C) **lime, chemical, gas or glass,** carloads, minimum weight 30,000 lb., from Pinola, Penn., Cavetown, Security, Hagerstown, Marl, Pinesburg, Charlton, Md., Thomasville, Bricklyn, York, Hanover and Bittinger, Penn., to Alten Mine No. 7 to Alsace, Penn.: (A) 17c, (B) 13½c and (C) 17c per 100 lb.

27197. **Crushed stone,** cardoads (See Note 2), from Devault, Penn., to Reybold, Del., 90c per net ton. (Present rate, $1.05.) (See Note 4.)

27203. **Slag, in bulk,** carloads (See Note 2), from Bethlehem, Penn., to Granville, N. Y. $3.80 per net ton. (Present rate, 28½c per 100 lb.) Reason—Proposed rate compares favorably with rates from Bethlehem, Penn., to Proctor, Bennington and Rutland, Vt.

27207. **Limestone, crude, fluxing, foundry and furnace,** when shipped in open top equipment, carloads (See Note 2), from Ashcom, Hamers Mill to Belfast Colliery, Barnham to Lewiston and Pleasant Gap, Penn., to Barberton, O., $2.37 per gross ton. (Present rate, 17c per 100 lb.) Reason—Proposed rate is comparable with rate to Cleveland, O.

27210. (A) **Building sand,** carloads; (B) engine, **blast, glass, molding sand and ground flint,** carloads (See Note 2), from Berkeley Springs, Great Cacapon and Hancock, W. Va., and Triplett and Gore, Va., to Montrose, Penn.: (A) $2.40 and (B) $2.60 per net ton. Reason—Proposed rates are comparable with rates from the Mapleton district.

27212. **Sand, blast, engine, foundry, glass, molding, quartz, silex or silica,** carloads (See Note 2), from southern New Jersey sand shipping points, Group No. 1, viz.: Bellmawr, Blenheim, Buck Hill, Clementon, Corbin, Downer, Folson, Glassboro, Grenloch, Pancoast, Penbryn, Pine Valley, Radix, Richland, Robanna, Tuckahoe, Williamstown and Williamstown Junction, N. J., to Oreland, Penn. $1.60 per net ton. (Present rate, $1.80. (See Note 4.)

27214. **Crushed stone,** carloads (See Note 2), from Casparis, Penn., to points in West Virginia.

	Prop. rates		Prop. rates
Romney	120	Moorefield	130
Patterson Creek	110	Petersburg	140
Springfield	120	Huttonsville	160

Rates in cents per net ton. Reason—Proposed rates are based on I. C. C. Docket 15329.

M-1813. To advance the rate from $1 to $1.10 per net ton on **crushed stone,** carloads, **gravel and sand,** N. O. I. B. N. in O. C., except blast, engine, foundry, glass, molding, quartz, silex and silica, carloads (See Note 2), from Sherburne, N. Y., to all points on the Unadilla Valley Railway.

27222. **Sand and gravel,** carloads (See Note 2), from Hopatcong Junction, N. J., to Caldwell, N. J., and Montclair, N. J., $1.04 per net ton. (Present rate, $1.50.) (See Note 4.)

27227. **Furnace or Fluxing limestone,** carloads

(See Note 2), from Linville, Va., to Baltimore and Sparrows Point, Md., $1.89 per gross ton. To apply only on shipments in open top equipment. (See Note 4.)

27235. **Crushed stone, coated with oil, tar or asphaltum,** carloads (See Note 2), from Martinsburg, W. Va., to N. & W. Ry. stations, Lynchburg, Agnor, Waynesboro, Limeton, Briggs, Rippon, Antietam, Salem, Singer, Eggleston and various. Rates ranging from $1.10 to $2.60 per net ton. Reason—Proposed rates are based on I. & S. Docket 1885 scale for actual distance.

27243. **Sand and gravel,** carloads (See Note 2), from Pinewald, Quail Run and Toms River, N. J., to Ottawa, Ont., $5.30 per net ton. (Present rate, 39½c per 100 lb., sixth class.) Reason—Proposed rate is same as now in effect from Vineland, N. J.

27244. **Sand and gravel,** other than blast, engine, foundry, glass, molding or silica, carloads (See Note 2), from Avon and Canawaugus, N. Y., to Cuylerville, N. Y. (billing station, Mt. Morris, N. Y.), 60c per net ton. (Present rate, $1.) Reason—Proposed rate compares favorably with rate from Canawaugus, N. Y., to Garbutt and Rochester, N. Y.

27254. **Agricultural and chemical lime,** carloads, minimum weight 30,000 lb., from York, Union Stone Co., Billmyer, Bainbridge and Rheems, Penn., to Snyders, Penn., 13c per 100 lb. (Present rate, 14c.) (See Note 4.)

27134. To amend Rate Proposal No. 27134 by eliminating therefrom the commodity "**sand and gravel,**" thereby making the proposal applicable only on "**stone, natural** (other than bituminous asphalt rock), dust, carloads, in shipping containers, loaded on container cars."

CENTRAL FREIGHT ASSOCIATION DOCKET

28784. To establish on **spent or refuse grinding sand,** carloads (See Note 3), from Butler, Penn.

To	Prop. rates A	Prop. rates B	Pres. rates
Donora, Penn.	* 90	*104	15½
Titusville, Penn.	*120	*138	17

A—In open top equipment.
B—In box cars.
*Rates in cents per ton of 2000 lb.

28785. To establish on **refuse material** (burnt or refuse sand), carloads (See Note 3), from Pittsburgh, Penn., to Erie, Penn., rate of 120c in open top equipment and 138c per net ton in box cars. Present, 243c in open top equipment and in box cars.

28792. To establish on **sand and gravel,** carloads, from Indianapolis, Ind., to Zionsville, Ind., rate of 50c per net ton, said rate to expire November 1, 1931. Present, 60c.

28799. To establish on **sand and gravel,** carloads, in open top equipment, rates in cents per ton of 2000 lb.

To	From Howard, O. Prop.	From Howard, O. Pres.	From Brink Haven, O. Prop.	From Brink Haven, O. Pres.
Flint, O.	100	120	100	130
Delaware, O.	100	120	100	130
Marion, O.	.....	100	100	120

28809. To establish on **sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass grinding or polishing, loam, molding or silica), or **gravel,** carloads, to points in Pennsylvania.

To	Proposed	Present rates From Cleveland, O.	Present rates From Phalanx, O.	Present rates From Mahoning, Mantua, O.	Present rates From Niles, O.
Bessemer	120	160	139	151	139
Braddock	120	160	139	151	125
Rankin	120	160	139	151	125
Homestead	120	160	139	151	125
Lucas	120	160	139	140	125
Pittsburgh	120	160	139	151	125
McKees Rocks	120	160	139	151	125
Groveton	120	160	139	151	125
Corapolis	120	160	139	151	125
Stoops Ferry	120	160	139	151	125

Rates in cents per ton of 2000 lb.

28813. To establish on **sand and gravel,** carloads, in open top equipment, from Columbus, O., to Pataskala, O., rate of 55c per net ton. Present, 60c.

28814. To establish on **crushed stone,** carloads, from McVittys, O., to Glindale, O., rate of 110c per net ton. Route—Via C. C. C. & St. L. Ry., Dayton, O., thence B. & O. R. R. Present, 340c.

28823. To establish on **sand and gravel,** carloads, from Chillicothe, O., to Huntington, W. Va., rate of 120c per net ton. Route—Via B. & O. R. R., Vauces, O., and C. & O. Ry. Present—139c. (Charleston, W. Va., rate.)

28824. To establish on **stone, crushed** (in bulk), **crushed stone screenings** (in bulk), **agricultural limestone** (not ground or pulverized, in bulk, in open top cars), and **agricultural limestone screenings,** carloads, from Sandusky, O., to Cleveland, O., rate of 70c per net ton. Present. 80c.

28829. To establish on **granulated slag,** carloads (See Note 3), from Warren, O., to Buffalo, N. Y., rate of 140c per net ton. Present, 20c (sixth class).

28838. To establish on **sand and gravel,** carloads, from Brevoorts, Ind., to Claremont and Olney, 80c, and to Noble, Ill., 85c per net ton, said rates to apply via C. C. C. & St. L. Ry., Vincennes, Ind., thence B. & O. R. R. and to expire November 1, 1931. Present, 91c to Claremont, and 95c to Olney and Noble, Ill.

28839. To establish on **agricultural lime,** carloads, minimum weight 30,000 lb., from Carey, O., to Cincinnati, O., rate of 11c applicable on traffic destined to points south of the Ohio river. Present —There is no present rate published from Carey to Cincinnati, O., applicable on traffic for beyond.

28840. To establish on **sand and gravel,** carloads, from Richwood, O., to Fostoria, O., rate of 80c per net ton, said rate to expire December 31, 1931. (Truck competitive rate.) Present, 90c.

28842. To establish on **limestone, agricultural, unburned; stone, crushed, and stone screenings,** in bulk, in open top cars, in straight or mixed carloads, from Woodville and Gibsonburg, O., to Geneva, O., rate of 125c per net ton. Route—P. R. R., Maple Grove, O., N. Y. C. & St. L. R. R. Present, 135c.

28845. To establish on **sand,** viz., **blast, core, engine, filter, fire or furnace, foundry, glass, grinding, loam, molding and silica,** carloads, from Irving, N. Y., to Corry, Penn., rate of 140c and to New Castle, Penn., 227c per net ton. Present—270c to Corry, Penn., and 360c to New Castle.

28846. To establish on **limestone,** raw dolomite, in box cars, carloads (See Note 3), from Carey, O. Rates in cents per net ton.

To	Pres.	Prop.
Anderson, Ind.	370	170
Clarksburg, W. Va.	460	210
Dunkirk, Ind.	340	165
Elwood, W. Va.	370	180
Fairmont, W. Va.	460	210
Gas City, Ind.	340	170
Grafton, W. Va.	460	210
Hartford City, Ind.	340	170
Kokomo, Ind.	370	180
Marion, Ind.	340	170
Muncie, Ind.	340	170
Olean, N. Y.	500	215
Shirley, Ind.	370	180
Upland, Ind.	340	170

28847. To establish on **stone, crushed** (in bulk), carloads, from Lehigh, Ill., to Forest City, Ind., rate of 60c per net ton, said rate to expire with the close of business December 31, 1931. Present —69c.

28850. To establish on **crushed stone** (in bulk) **and limestone, unburned agricultural** (in bulk, in open top cars), carloads, from West Columbus, O., to Swiss, W. Va., rate of 165c per net ton. Present, 215c.

28859. To establish on **crushed stone,** in bulk, in open top cars, carloads, from Marble Cliff, O., to Marne, rate of 80c, and to Black Run, O., rate of 75c per net ton, said rates to expire December 31, 1931. Present—80c.

SOUTHERN FREIGHT ASSOCIATION DOCKET

55346. **Stone, crushed** (except bituminous rock or bituminous asphalt rock), **rubble stone and broken stone,** carloads, Harriman, Tenn., to Jamestown, Tenn. Present rate, 140c per net ton; proposed rate, 115c per net ton (to expire December 31, 1931, unless sooner canceled, changed or extended).

55357. **Gravel and sand,** carloads, Twohy Siding, Va., to Morse, Flora, Snowden, Addison's Siding, Shawboro, Ferebee Siding, Gregory, Mason's Siding, Scott's Siding, Belcross, Camden and Elizabeth City, N. C. It is proposed to cancel the rate on gravel and sand, caloads, from and to the above per net ton, published in Supplement 170 to named points and allow rate of 150c Agent Cottrell's I. C. C. 727, to apply after cancellation.

55405. **Sand, molding,** carloads, Lipe, Tenn., to St. Louis, Mo., East St. Louis, Belleville and O'Fallon, Ill. It is proposed to establish rate of $2.32 per net ton on molding sand, carloads (See Note 3), from Lipe, Tenn., to O'Fallon, Ill., in lieu of present rate of 29c per 100 lb., and in addition to extend the application of the present rate of 232c per ton from Lipe to St. Louis, Mo., East St. Louis and Belleville, Ill., which is at present applicable only via N. C. & St. L. Railway, Paducah, Ky., and C. B. & Q. or I. C. R. R. beyond, to also apply via Nashville, Tenn., and L. & N. R. R. beyond.

55408. **Limestone, ground or pulverized,** carloads, Valmeyer, Ill., to Memphis, Tenn., and New Orleans, La. At present combination rates apply. It is proposed to establish rates on limestone, ground or pulverized, carloads, minimum weight 60,000 lb., from Valmeyer, Ill., to Memphis, Tenn., 210c; New Orleans, La., 390c per net ton.

55431. **Stone or marble, broken or crushed, and marble spalls,** carloads, Whitestone, Ga., to Pittsburgh, Penn. At present combination rate applies. It is proposed to establish rates on stone or marble, broken or crushed, and marble spalls, in straight or mixed carloads (See Note 3), from Whitestone, Ga., to Pittsburgh, Penn., 502c per net ton.

55435. **Lime, fluxing,** having no commercial value for chemical or building purposes, carloads, Pelham, Ala., to Alabama City, Ala. Present rate, $1.78 per net ton. Proposed rate, carload minimum weight 80% of marked capacity of car, but not less than 60,000 lb., from Pelham, Ala., to Alabama City, Ala., $1 per net ton.

55438. **Sand,** carloads, Talbird, N. C., to Bassett, Fieldale and Martinsville, Va. Present rate, to Fieldale and Bassett, Va., 195c; Martinsville, Va., 190c per net ton (combination). Proposed rate on sand, carload minimum weight 100,000 lb. (when 90% of marked capacity is less than 100,000 lb. such 90% of marked capacity will apply as minimum), except when cars are loaded to their visible capacity the actual weight will govern, from and to the above named points, 145c per net ton—made on basis of Docket I. C. C. 17517 scale.

55439. **Sand,** carloads, Sand Pit, Va., to Ude, Lavoy and Vimy, W. Va. Present rate, 274c per net ton. Proposed rate on sand, carload minimum weight 100,000 lb. (when 90% of marked capacity is less than 100,000 lb. such 90% of marked capacity will apply as minimum), except when cars are loaded to their visible capacity the actual weight will govern, from and to the above named points, 216c per net ton—same as currently in effect to nearby points such as Sprigg, Sycamore Branch Junction and Williamson, W. Va.

55443. **Phosphate rock and limestone, phosphatic,** carloads, L. & N. R. R. stations in Tennessee to Mobile, Ala., on traffic destined to Pacific Coast via the Panama Canal. At present, local domestic rates apply. It is proposed to establish rates on phosphate rock and phosphatic limestone, carloads, from L. & N. R. R. stations named in L. & N. R. R., G. F. O. 30-B, I. C. C. A-15252, to Mobile, Ala., when for Pacific Coast via the Panama Canal as follows: From Group 1, 248c; from Group 2, 293c; from Group 3, 248c per net ton—made in line with rate to Pensacola, Fla.

55448. **Lime screenings** (refuse derived from manufacture of lime), carloads, Summitville to Pulaski, Tenn. Present rate, 362c per net ton. Proposed rate on lime screenings (refuse derived from manufacture of lime), not exceeding size sufficient to pass through screen of 5/16 in. mesh, carload minimum weight 30,000 lb., from Summitville, Tenn., to Pulaski, Tenn., 180c per net ton.

SOUTHWESTERN FREIGHT BUREAU DOCKET

23069. **Crushed stone, etc.,** from Krause, Ill., to Cuba and Steelville. Mo. To establish a rate of $1.40 per net ton of 2000 lb. on stone, crushed (broken stone ranging in size up to 200 lb. in weight), including ground limestone, but not including gypsum rock, straight or mixed carloads, minimum weight 80,000 lb., or marked capacity of car if less from Krause, Ill., to Cuba and Steelville, Mo. Shippers advise of operations in the vicinity of Cuba and Steelville, Mo., which will require approximately 7000 tons of stone. They further state that if the proposed rate is established there is a possibility of supplying this stone from Krause, Ill., otherwise a local quarry will supply the stone and the railroads will lose the business.

23093. **Crushed stone or chatts,** from Joplin-Webb City district to points in Oklahoma. To establish rates on crushed stone or chatts, coated with oil, tar or asphaltum, carloads, minimum weight marked capacity of car, but not less than 50,000 lb., from Joplin-Webb City district to points in Oklahoma, based 1c per 100 lb. higher than the rates on chatts. Rates from points in the Joplin, Mo., district to points in Kansas are made differentially 1c per 100 lb. higher than the corresponding rate on chatts. Shippers request that the same basis be employed in establishing rates to points in Oklahoma.

23097. **Phosphate rock,** from Gulfport, Miss., on coastwise traffic to Texarkana, Ark.-Tex. To establish a rate of 17c per 100 lb. on phosphate rock, crude, ground or pulverized, carloads, minimum weight 80,000 lb., from Gulfport, Miss., on coastwise traffic, to Texarkana, Ark.-Tex. Rate of 17c has been established from Port Arthur to Texarkana, based 2c over rate applying to Shreveport. The domestic rate from Gulfport to Shreveport is 25c, to Texarkana, 27c. The coastwise rate from Gulfport to Shreveport is 15c. The proposed 17c rate is believed to be justified on the grounds that the rate from Gulfport and New Orleans to Shreveport is the same, or 15c, and secondly that the domestic rate to Texarkana is 2c higher than to Shreveport and applying this 2c difference to the coastwise rate would produce 17c.

7645. Rates: **Rock, phosphate,** carloads, from Mount Pleasant, Tenn., district. To points in Iowa.

	Pres. rate	Prop. rate*		Pres. rate	Prop. rate*
Ortonville	$7.26	$7.07	Linden	7.36	7.07
Adel	7.26	7.07	Panora	7.36	7.07
Kennedy	7.36	7.07	Summit	7.36	7.07
Redfield	7.36	7.07	Yale	7.36	7.07
Caldwell	7.36	7.07			

*Per net ton.

Sup. 2 to 6983-D. **Sand,** carloads, as described

in W. T. L. Tariff 41-R, from Bowes, Ill., to Ford, Ojibway, Point Edward, Sandwich, Sarnia, Walkerville, Windsor and Wallaceburg, Ont. Rates: Present, class rates; proposed, 350c per net ton.

5298-A. **Sand,** carloads, from Brownton, Wis. Rates per net ton. To (representative points):

	Pres.	Prop.
Baton Rouge, La.	*	$5.30
Corinth, Miss.	*	4.00
Greenville, Miss.	*	4.90
Hattiesburg, Miss.	*	5.30
Jackson, Tenn.	*	3.70

*Class rates.

6227. **Stone, broken, crushed or ground,** also **agricultural limestone,** carloads, usual minimum weight, from Columbia Quarry No. 2, Stolle and Krause, Ill., to C. B. & Q. R. R. stations in Illinois. Rates per net ton. To (representative points):

	Pres.	Prop.
Concord, Ill.	$1.49	$1.24
Chapin, Ill.	1.36	1.24
Alsey, Ill.	1.26	1.24
Joy Prairie, Ill.	*	1.25
Atwater, Ill.	*	1.25

*Class rates.

WESTERN TRUNK LINE DOCKET

2030-E. **Amiesite** (asphalt coated crushed stone) **and chatts, asphalt coated** (See Note 1), but not less than 50,000 lb., except when car is loaded to full visible or space carrying capacity, in which case actual weight will govern, from Iantha, Liberal and Lamar, Mo., to Iowa, Kansas, Missouri and Nebraska stations provided with rates under column C of St. L.-S. F. Ry. Tariff No. 703J. Rates—Present, class or combination rates; proposed, to amend explanation of reference mark circle 1 opposite stations Iantha, Liberal and Lamar, Mo., in Item 60E of Supplement 29 to St. L.-S. F. Ry. Tariff 703J, to read as follows: "Applies only in connection with column C rates."

7633. Rates, **Stone, crushed, rubble, etc.,** as described in Item 2395 of W. T. L. Tariff 1-S, I. C. C. No. A-2105, from Fort Madison, Ia., to Omaha, Neb. Rates: Present, 13½c per 100 lb.; proposed, 10c per 100 lb.

1999-B. **Stone** (waste), **breakwater,** carloads (See Note 1), from Kasota, Minn., and Mankato, Minn., to Sioux City, Ia. Rates: Present, 7½c per 100 lb.; proposed, 6c per 100 lb.

Refund on Gravel Rates Ordered

THE NORTH WESTERN railroad was ordered to refund to the Northern Gravel Co., Kewaskum, Wis., the difference between rates charged and those which would have accrued if reasonable from Barton, Wis., to New Butler, Shorewood and Lindwerm, at the hearing of the Wisconsin state railroad commission, June 2.—*Kenosha* (Wis.) *News.*

Order Cut in Nebraska Freight Rates

GRANTING an emergency order which will permit the state and counties to benefit from reduced gravel rates on highway projects for which bids were received May 29, the state railway commission made the first move recently towards lowered freight rates on carload lots of gravel.

The emergency order, affecting 13 gravel pits of eight companies, was effective only until June 8. That is the date when the general hearing on the commission's order to all Nebraska railroads to show cause why gravel rates should not be reduced, was heard.

The reductions, ordered into effect at once, were designed principally as an aid in reducing highway construction costs. For the most part it represents points for which reductions were asked by the Burlington.

The reduced rates ordered are not, however, limited to the points specified by the Burlington. All pits must be permitted the reduction, the commission ordered, from each station where the reduction was approved.

The reductions amount to from 30 to 33⅓%. It is generally understood that the commission hopes to make reductions of about that percentage general throughout the state from all gravel pits on railroads.

The emergency order, commissioners feel, will make it possible to effect substantial savings in highway costs without giving one company a permanent distinct competitive advantage as in the original Burlington application.—*Lincoln* (Neb.) *Star.*

Order Affecting Georgia Intrastate Rates Is Upheld by Supreme Court

IN THE CASE of Georgia Public Service Commission et al., vs. United States of America et al., the supreme court has found the ruling designed for prevention of discrimination in commerce valid.

This case was a proceeding on rates on chert, clay, sand and gravel within the state of Georgia, in which the Commission was petitioned to determine whether certain intrastate carload rates on these products, prescribed by the Georgia Public Service Commission, were unduly prejudicial to persons or localities engaged in interstate commerce. Several related cases were heard on the same record and dealt with in the same report. Therein, the Interstate Commerce Commission prescribed certain distance scales as a maximum reasonable for interstate rates between points in Georgia and points in other states; and found that there was no reason for the maintenance of a different basis of intrastate rates for these commodities within the state of Georgia. It did not enter an order because it believed "that the Georgia commission will co-operate in authorizing such revisions as might be necessary to bring their rates into harmony with the interstate adjustment approved."

Thereafter the carriers applied to the Georgia Public Service Commission to establish the same distance scales for intrastate traffic. The state commission refused the application and directed them to establish a scale differing from that applicable to interstate traffic. With that direction the carriers complied; but they petitioned the Interstate Commerce Commission to reopen its proceedings.

The petition to reopen the case was granted. Upon the supplemental hearing, the Interstate Commerce Commission found prejudice and discrimination had resulted, and will result, from the rates prescribed by the Georgia Commission; and ordered the carriers to establish intrastate rates "which shall not be lower, distance considered, than the rates contemporaneously applicable" to the interstate commerce.

To enjoin and set aside that order of the Interstate Commerce Commission, and to restrain the carriers from establishing intrastate rates pursuant thereto, two suits were brought in the federal court of northern Georgia.

The cases were heard by the district court on an application for an interlocutory injunction, the bills and answers alone being introduced. The injunction was denied. After final hearing on the full record of the proceedings before the Interstate Commerce Commission, the consolidated bill was dismissed. The appeal to the supreme court is from the final decree.

First. Appellants contend that the order of the Interstate Commerce Commission is void, because it was entered without the full hearing prescribed by section 13. The supreme court found the appellants' objection to the procedure unfounded.

Second. Appellants contend that while the order prescribes a minimum and a maximum basis for intrastate rates, the minimum basis is so vague and uncertain as to render the entire order void.

The supreme court found it clear from the terms of the order that the interstate rates referred to are those now applicable and maintained. Because of divergent conditions, a doubt may well arise in applying the rule prescribed to some particular situation. But possible uncertainty of application in isolated instances is not a sufficient ground for setting aside in its entirety, by judicial process, a carefully drawn order, otherwise valid and practicable of operation over a wide territory.

Third. The appellants contend that the order is void because there are no adequate findings of undue disparity between the rates charged for intrastate transportation in Georgia and the rates actually in force for interstate transportation; and also because there was no finding that the intrastate rates imposed an undue burden upon the carriers' interstate revenues or that the alteration of the intrastate rates would produce additional revenue. It was the opinion of the court that the findings in the report were definite and comprehensive. There are, moreover, illustrative specific findings which confirm the general ones.

Fourth. The appellants contend that the findings are unsupported by the evidence. The supreme court found the proof of the discrimination against interstate commerce specific and typical, and clearly sufficient to establish the undue prejudice to interstate shippers.

Fifth. Appellants contend that the order was an arbitrary exercise of the Commission's limited power over interstate rates and that it constitutes an invasion of the sovereign rights of the state. In the opinion of the supreme court the facts to which its attention is called furnish no support for the charge of arbitrariness or of invasion of the sovereign rights of the state.

Wisconsin Sand and Gravel Industry Asks State to End Price War

CHARGES OF UNFAIR trade practices were lodged against 28 members and 20 non-members of the Sand, Gravel and Stone Cooperative Association of Wisconsin in a complaint filed June 11 at Madison with Joseph D. Beck, commissioner of agriculture, by Attorney Peter Leuch, counsel for the association.

Most of the firms and individual dealers named in the complaint are from Milwaukee. Attorney Leuch described the action as a test of the state cooperative marketing act.

The association asks the commisioner and the marketing division of the state agricultural department to investigate and to take steps to preserve the regulation of the industry under the state cooperative marketing laws.

If the investigation discloses that sand and gravel men have been involved in unfair trade practices, members of the cooperative said, orders to desist will be issued by the commissioner of agriculture. If the orders are ignored, it was said, suits will be instituted to make a test of the state cooperative marketing laws.

Because the complaint involves practically every sand and gravel dealer in Milwaukee and its environs, regardless of his membership in the association, it was pointed out, the investigation will be of broad scope. Thus the records of all firms will be available.

The complaint says that the association has attempted to operate under a code of ethics adopted under the supervision of the state marketing division but that the code has been repeatedly violated.

The association charges that the members and non-members listed in the complaint have been selling materials at or below cost. The complaint points out that the market has been demoralized by such practices and that wages for labor have suffered. Another consequence, the complaint avers, will be that the state will suffer losses in income taxes.

The association also charges that materials have been sold to trucking companies and brought to the Milwaukee territory at or below cost. The truck companies, it is alleged, violate the state highway department regulations regarding the weight and speed laws. The state highway department limits truck tonnage and speed to protect the highways.

The association was organized recently and has attempted to maintain prices at a profit returning level in the face of competition for contracts. There were rumblings of discord as prices for materials continued to sink. The city recently, for example, bought sand, gravel and crushed stone at prices lower than ever before in its history.

$5000 Fine Authorized

The board of directors of the association is empowered to require a $5,000 bond from each member firm and to impose a $5,000 fine for violation of the trade code, according to the constitution and by-laws of the association.

The 28 members named in the complaints are:

Elkhart-Moraine Sand & Gravel Co., Elkhart, Wis.; G. Beck, F. A. Becker, Inc., Berthelet Pipe & Supply Co., Druecker-Kaestner Co., H. C. Ische, Jaeger Sand & Gravel Co., P. J. Krueger & Sons, H. C. Luedtke Fuel & Supply Co., Lutz Sand & Gravel Co., Lannon Sand & Stone Co., North Lake Sand & Gravel Co., Ozaukee Sand & Gravel Co., Gerling Brothers, Pipkorn-Marggraff Co., Werner Stein, State Washed Sand & Gravel Co., Wisconsin Sand & Gravel Co., all of Milwaukee; Druml Brothers, West Milwaukee; O'Hara & Clark Co., West Allis Fuel & Supply Co., William Wolf, Hinz & Cooper, all of West Allis; E. A. Holden, F. Hartung Co., both of Wauwatosa; Hartland Washed Sand & Gravel Co., Hartland, Wis.; L. Pinzel, Hales Corners, Wis., and Kohler Brothers, Waukesha.

The non-members listed in the complaint are:

Badger Sand & Gravel Co., Big Bend Co., Hillside Washed Sand & Gravel Co., Janesville Sand & Gravel Co., Froeming Corporation, J. Kleist, Lakeshore Stone Co., Otto Ladwig & Sons; Manegold Stone Co., Northern Gravel Co., Consumers Supply Co., A. J. Reiske & Sons, J. Gough, B. Buck, Story Brothers, Waukesha Lime & Stone Co., Waukesha Sand & Gravel Co., H. J. Washichek, all of Milwaukee; Central Washed Sand & Gravel Co., and Francey Coal, Stone & Supply Co., Wauwatosa. —*Milwaukee* (Wis.) *Journal.*

Approve Minnesota Crushed Rock Loading Dock

OVER OBJECTION by the Inland Waterways Corp., Assistant Secretary of War Frederick H. Payne has approved an application by the D. L. Bell Holding Co. for permission to construct a rock-filled timber crib dock 240 ft. long and 16 ft. wide at the low-water shore line on the right bank of the Mississippi river, 1.5 miles downstream from Mendota, Minn. The purpose of the dock is for loading crushed rock into barges.

The government barge line contended that the mooring of barges at the proposed dock would constitute a hindrance to navigation and that the dock should be constructed about 3000 ft. upstream. Since the proposed location for the dock was adjacent to the quarry from which the rock would be obtained, said the War Department, to require its location as proposed by the Inland Waterways Corp. would defeat the purpose for which it was to be built.—*Traffic World.*

O. L. Cline

O. L. CLINE, formerly secretary and treasurer of the National Silica Sand Co., aged 63, died May 9, following an extended illness.

In his early life he was engaged with his father in the lumber and contracting business. He was an employee of the Erie Railroad from 1886 to 1904. He served as operator in Sharon, Penn., and Youngstown, and was station agent at Mineral Ridge when he resigned to accept a responsible position with the National Silica Sand Co., with offices in Niles. He was secretary and treasurer and a director of the company from 1916 until his death.

He has resided in Mineral Ridge, Ohio, for the past 28 years.

Tyler Henshaw

NEWS of the death of Tyler Henshaw, vice-president of the Riverside Cement Co., Riverside, Calif., was received by officers of the company June 2. Mr. Henshaw expired in San Francisco, where he had made his residence for many years.

Funeral services were held June 4, in San Francisco. During the funeral period the Crestmore plant was shut down for several minutes.

Mr. Henshaw was one of the prominent citizens of the Bay district, active in many civic and public projects.—*Riverside* (Calif.) *Enterprise.*

Horace Adelbert Middaugh

ON MAY 26, Horace A. Middaugh, founder of the Pioneer Sand and Gravel Co., Seattle, Wash., died at the age of 84. Mr. Middaugh initiated concrete paving in Seattle by donating two blocks to the city. He went to Seattle from Pennsylvania some 40 years ago, and spent many years on railroad construction work.

Origin of Virginia Talc and Soapstone Deposits

THE GEOGRAPHIC distribution of deposits of talc and soapstone in Virginia is discussed and their characteristics described in an article by J. D. Burfoot, Jr. The presence or absence of talc, soapstone or steatite in this region is thought to depend, in part at least, on the occurrence of the correct segregation product—pyroxenites, periodites or dunites; on the presence of feeding channels leading to these rocks; and on the invasion of the correct type of solutions, that is, solutions of the correct chemical character with the requisite temperature and pressure. The condition of differential stress is not necessary for the formation of talc. The mineral association and paragenesis seem to indicate that talc is formed under deep or intermediate vein zone conditions.—*Chemical Abstracts.*

Back to Sanity

Working Capital at Discounts, Factories Given Away in Stock Market

By Thomas F. Woodlock

DURING April and May 101,000,000 shares of stock were sold on the New York Stock Exchange at constantly declining prices. Also 101,000,000 shares of stock were bought. Who used the better judgment, the sellers, or the buyers?

The lower prices went, the more mired became the market, Fear rather than reason appeared to rule. Since then there has been some return to sanity. Rising prices have lifted the overwhelming clouds of pessimism.

Who bought? And why? During the two months cash buyers purchased not less than $467,000,000 of securities from holders who were in debt either to brokers or to banks. In addition, cash buyers absorbed over $700,000,000 of newly issued securities.

Is not the soundest basis being laid for future stock prices when securities pass from the weak hands of those who are in debt to the strong hands of those with cash resources? Is it not sufficient that some people have a sufficiently firm conviction of America's economic future to back their judgment by the outright purchase of over $1,101,000,000 securities in two months and of over $3,000,000,000 in five months?

Editor's Note

ONCE in a great while the editor departs from his most cherished rule of not printing anything in this journal which does not relate specifically to the industries served by this journal. The accompanying article, reprinted from the "Wall Street Journal," is one of the rare exceptions to the rule.

This article is too good and too thought-provoking and stimulating not to be read by every business man. Commodity prices are not the only things that have shrunk beyond all conscience. But, it is always darkest just before the dawn. Certainly, we must have hit bottom. What we have to look forward to is an upgrade, at least.

What Mr. Woodlock says about stock prices is equally true of commodity prices, i. e., the soundest basis for the future is being laid when the control passes from weak to strong hands. So let's have the strength to hold on a while longer!

—The Editor.

Why They Bought

One can only surmise why these individuals bought. Can it be that they are looking to the creation of the abiding fortunes that can be built in neither a day nor a year; that they are looking farther ahead than the immediate fluctuation of prices and are disregarding the near future of vanishing earnings and suspended dividends?

Is there not a limit to reasonable price deflation? And is not that limit exceeded when the market appraises as valueless plants, costing millions, organizations built up to a point of high efficiency, patents and good names that cannot be duplicated?

Without opinion as to whether prices may go lower than in early June, realizing that industrial profits may remain at ebb for a protracted period, *the Wall Street Journal* presents herewith a few examples of companies which recently sold at such levels.

Westinghouse Electric for $1.12 a Share?

Each share of Westinghouse Electric common now represents $37 of net current assets and one and one-half shares of Radio Corp. with a market value of $18 at recent lows, making a total of $55, against a recent low on the Stock Exchange of 56⅛. This means that Westinghouse's plants, patents and miscellaneous investments were being valued by the market at approximately $1.12 a share, although these assets produced earnings of $4.46 a share in the depression year of 1930, and had a depreciated book value of $29 a share.

But another way, the market valuation of Westinghouse stocks at recent levels was $152,446,000, or $5,153,000 less than the combined net current assets and investments in wholly-owned subsidiary and associated companies. The company's lands, factories, service stations, office buildings, etc., carried on the balance sheet at a depreciated value of $72,272,128, are thus appraised as valueless by the market place. Similarly its patents and processes, the outcome of the lifetime work of scores of scientists and millions spent on research, are considered without market value.

If Westinghouse were to shut up shop, dispose of its investments and current assets and offer its plants and patents for sale, current prices for the stock would obviously be absurdly low. Can it be that the stock market thinks that Westinghouse is entering a prolonged period of deficit operations which will dissipate current assets? Is such an outlook justified? In 1930 Westinghouse earned $4.46 a share. In the first quarter of this year it reported a deficit, but currently, despite wretched general business conditions, the company is about breaking even, with prospects for the whole year anything but hopeless. Looking back, one finds this second largest electric equipment company has a record of profitable operations each year since 1909. Does the present depression mark the end of the 'electrical age" which made these earnings possible, or is it more logical to regard it as a temporary hesitation?

Government Bonds for 63c on the Dollar

If anybody with $3,700,000 could have persuaded the 1,250 stockholders of Lima Locomotive to dispose of their holdings at the recent low price of 19¼ a share, he could have made an immediate profit of nearly $2,400,000 by selling the company's United States government securities. And after taking this profit he still would have owned the company's plants, patents, drawings and good will, not to mention over $2,155,000 of net quick assets.

On December 31, 1930, Lima Locomotive had current liabilities of $781,715 and current assets exclusive of government bonds of $3,321,833. Payment of a $2 common dividend has since reduced net quick assets to around $2,155,000. The company owed no other money, had no bondholders and no preferred stock outstanding, so that its holdings of $6,084,575 government securities represented surplus belonging to the holders of Lima's 192,527 common shares. At recent lows these shares were selling for $3,706,000, which means that the market was appraising the company's government bonds at 63 cents on the dollar and all its other assets at nothing.

Standard of Indiana

Founded in 1889, Standard Oil of Indiana has shown a profit each year since 1911 (prior figures not available) and has paid uninterrupted dividends. Yet at its recent low of 19⅛ the common stock was selling for 48% of its book value, for seven times 1930 earnings of $2.73, for 6.6 times average annual earnings in the past 11 years (including three depression years) and to yield 10½% on its dividend, which has already been reduced to conform to present business conditions.

Cuban Cement Production

DOMESTIC cement production in Cuba during the first four months of the current year totaled 140,000 bbl., which represents a marked decrease as compared with the similar period of 1930, according to *Commerce Reports*. This decline is chiefly attributable to the fact that the Central Highway, which consumed tremendous quantities of domestic cement during 1930, is completed.

The only portland cement plant in Cuba is a subsidiary of the International Cement Corp., New York City.

Ed. Shaw's News Letter From Los Angeles

A CORRESPONDENT writes that he wishes the article on the Irwindale plant of the Consolidated Rock Products Co., of this city, which appeared in the June 6 issue, had been a little more explicit about certain details. He wanted to know how this plant came to be built in a locality that had so many plants in operation and he also asked several questions about the technique of mixing aggregates on the belt described and how segregation is prevented. It should have been mentioned that the plant was built by the Consumers' Rock and Gravel Co., one of the companies that afterward formed the Consolidated Rock Products Co. And it was built at a time when competition was at its worst. In those times the fact that a plant was needed or not needed had very little to do with the decision to build or not to build.

Mixing Aggregates at the Irwindale Plant

Not knowing too much about the technique of mixing, I asked Mr. Jumper, the engineer of the Consolidated, to explain it to me. He said first that mixing is no longer as important as it was before because so large a part of the production of aggregates is sold in separate sizes. The city, state and county engineers prefer to use separate sizes, or the "four-way mix." So do the engineers who control many important private jobs. But the city of Glendale buys aggregate with limits of fineness modulus and so does the Los Angeles Board of Education. And when the Consolidated is asked to design a mix, as often happens, it mixes according to the fineness modulus. So mixing is really important, even though the larger part of the product is sold in separate sizes.

Designating the Mix

The correspondent asks what a 60-25-15 mix signifies. The figures of course are percentages and might mean a mix of Nos. 1, 2, and 3 sizes. But usually they would stand for a mixture of No. 1, No. 23 and No. 4, these being the sizes from which most coarse aggregates are mixed whether at the plant or on the job. There are bins for each of these but the mix does not mean that 60% shall come from No. 1 bin, 25% from No. 23 bin and 15% from No. 4 bin. The numbers are used to indicate limits of sizes. If, after the mix is made, a sample shows that 60% is between 2½-in. and 1½-in., 25% between 1½-in. and ⅜-in., and 15% between ⅜-in. and No. 4, it fills the specification. These figures were taken without thinking much of the gradation they would make and they plot as a humpbacked curve. A better curve is made from 40% of No. 1, 32% of No. 23 and 8% of No. 4. Or, if it is desired to retain the 15% of No. 4 (pea gravel) it could be combined with 40% of No. 1 and 45% of No. 23 for a smooth grading.

Mixing to Definite Fineness Modulus

Mixing to a definite fineness modulus is, of course, quite as simple for it is only a few moments' work to sieve a sample from the belt and find the fineness modulus. Corrections can be made by either subtracting fine or coarse or adding fine or coarse; and the type of spout with the regulating wheel described in the article makes it easy to correct very closely. Some tolerance is generally permitted; thus, the city of Glendale wants sand with a fineness modulus of 3.00 to 3.20 and coarse aggregate with a fineness modulus of 7.00 to 7.50. Mr. Jumper said that when he was asked to design a mix he proportioned the sizes so as to have a complete aggregate with a fineness modulus around 5.40 to 5.50. He designs by trial following the method given in the Portland Cement Association's handbook. It has always given him satisfactory results in strength and workability although the strengths ran a little higher than they were calculated to be. He spoke of a recent instance in which the design was for 3000-lb. concrete and the test cylinders broke at 3200 to 3300.

Plant Sieve Tests

Those in charge of the different plants make sieve tests and do the ordinary testing required, and the company employs an assistant engineer, W. W. Alexander, who goes from plant to plant checking up on the sizing and gradation of the products. Curves of monthly production are plotted and records of gradations are kept. In sampling production it is preferred to take the samples from a number of cars rather than to take them from bins. And especial care is taken in sampling material as it goes into stock piles and in checking the material as it is loaded out of stockpiles. Segregation in loading cars seems to be sufficiently avoided by the usual swinging spout. Since so much of the product is sold in separate sizes there are not many complaints of segregation nowadays.

* * * * *

Aggregate Producers' Promotional Literature

Graham Bros., Long Beach, Calif., publishes an interesting little house organ which is called *Rockology*. One always finds something interesting in it and sometimes an unusually good thought like that of the following: "The production and sale of rock, sand, gravel and building materials generally would appear to be the last subject in which any romantic element or deep reader interest could be found. And yet these materials have been the stepping stones to civilization as we know it today. Without them we would be back in the mud and wattle days of the early Egyptians, or the epoch of the Chaldeans, who, from the slimy banks of the Euphrates, thousands of years ago, hand-molded the clay bricks which just now are being found in the ancient burial mounds of Ur." And this: "Land in its natural state can be compared to the raw materials of a manufacturer which require processing to complete the finished article. In real estate this processing consists in the development of utilities and pavements. . . . Careful study will reveal that where intelligence has been used in determining the types (of pavement and utilities) additions to the value of the property affected have exceeded the cost."

* * * * *

Cement Plant Agitation Expensive

The row over the Bell rock crusher for cement rock still keeps on. A special election is shortly to be held on petitions asking that the ordinance that would permit it to be built be repealed. This will cost us $100,000. Examining the names on the petition it is estimated will cost $12,000 more. And this follows a long and expensive trial which went all the way to the supreme court on the right of certain persons to sign the petitions. Of course lawyers and election clerks must live, but it would seem that there were better ways of spending the public money at such a time as this. And no one can estimate what this cause celebre has cost the cement industry from the ill feeling, the misrepresentation and the slander it has engendered.

Texas House Halts Cement Tax Bill

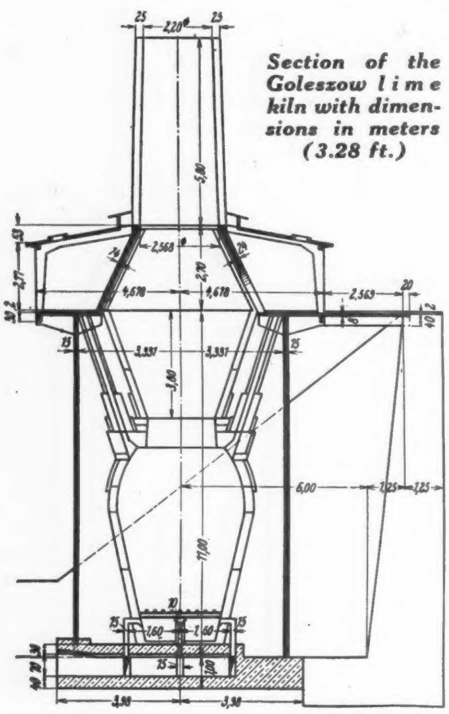
THE TEXAS House of Representatives, May 21, concurred in all but one of the Senate amendments to the peddler tax bill. The exception was made on the amendment levying a tax of 20 c. per bbl. on cement, on which a free conference committee was asked. Should the committee be unable to agree on the cement tax the entire bill would be killed.

Action of the House in accepting all but the cement tax will require the conference committee to concentrate its efforts toward an adjustment of differences on this point and preclude consideration of other items.

The motion to accept all amendments except the cement tax was made by Representative Sanders of Nacogdoches. Mr. Sanders' motion prevailed 71 to 58.—*San Antonio* (Tex.) *Express.*

Foreign Abstracts and Patent Review

Lime Kiln with Reinforced-Concrete Shell. A number of reinforced-concrete structures including cement storage bins, clinker storage structures, raw flour silos, kilns, and slurry tanks have recently been added to cement plants in Poland, according to Franz Urwalek. The Goleszow lime kiln is a shaft kiln producing 27 gross tons of burned lime in 24 hours. It consists of a reinforced-concrete shell 11 m. (36 ft.) high and of 6.66 m. (21.8 ft.) inside diameter, with walls 15 cm. (5.9 in.) thick. Inside this shell is a lining of refractory brick backed with masonry of ordinary good grade wall brick. Between the reinforced-concrete shell and the inner masonry is a space of 50 mm. (2 in.) which is filled with sand in the lower portion and with slag wool in the upper section, thus forming an insulation between the masonry and the reinforced-concrete casing. The roof above the kiln platform and the conical base of the stack are also made of reinforced concrete. The entire reinforced-concrete structure is installed independent of the kiln masonry. It was built by Smidth and Co.—*Beton u. Eisen* (1931) **30**, 4, pp. 57-65.



Section of the Goleszow lime kiln with dimensions in meters (3.28 ft.)

New Methods of the American Cement Industry Reviewed. Carl Naske reviews recent American developments in the production of cement. He shows in his introduction that there is an effort for increased economy through decreased production costs. He says this will be obtained by change in operation intended to effect improved quality of cement as well as increased productivity by the most economical means. Data are given on capacity and production of the industry in relation to earnings. Only those plants will be able to obtain satisfactory results, following the present crisis, which produce the maximum in quantity and quality by the simplest means; effort in this direction is shown by reconstruction work in a number of plants.

The author reviews the equipment in plants of Missouri Portland Cement Co., Petoskey Portland Cement Co., Manitowoc Portland Cement Co., Dewey Portland Cement Co., and the Wolverine Portland Cement Co. From this information the author concludes the following on the present trend in the American portland cement industry: (1) Improvement in quality in the sense that high-grade cement is the rule and normal cement the exception; (2) special attention to the viscous slurry process and increase in fineness of granulation of raw material and of cement; (3) decrease of production costs by filtering the viscous slurry; (4) increasing adaptation of closed-circuit grinding and for this purpose use of the vibrator screen, Dorr classifiers for the raw material and (predominantly) air separator for cement; (5) improvement of dust extraction equipment and safety arrangements, the latter being close to the limit of absolute safety of the works.

"Characteristic of the spirit of comradeship in which the American cement plants feel themselves tied together," wrote Herr Naske, "is the fact that in ROCK PRODUCTS, January 3, 1931, not less than 57 companies announced programs—frequently up to the most intimate details and to measurements in feet and inches—according to which they plan to rebuild, supplement or improve their plants. This unlimited frankness is, according to my conviction, the sharpest spur and the most effective impulse for the highest development of every industry in every country."—*Zement* (1931) **20**, 13, pp. 292-296.

Process of Gypsum Dehydration. F. Krauss and G. Joerns review briefly the literature on gypsum and its hydrates. Then, in their experiments, they find, as Jung and Linck had several years ago, that there is a stepwise decomposition from the dihydrate to the semihydrate, but find also that this does not occur at 99 deg. C., but at about 79 deg. C. In efforts to clear up this discrepancy, it was found that decomposition from the dihydrate to the semihydrate at 7 mm. pressure takes place at 59 deg. C., but that it is necessary to heat first to 73 deg. C. in order to obtain a pressure of 7 mm. In continued heating, a zeolithic curve of the semihydrate to the anhydrite was obtained, and dehydration was practically completed at about 125 deg. C.; but the last traces of water could not be removed until at 200 to 220 deg. C.

It follows that in the preparation of pure semihydrate, the raw gypsum should be heated briefly to its temperature of decomposition, but then cooled quickly to the temperature at which the transition from the dihydrate to the semihydrate takes place, so as to avoid the formation of products lower in water content. The test procedure and results are given in detail. The stepwise dehydration of dihydrate to semihydrate occurs at 59 deg. C. and 7 mm. pressure as follows:

$$CaSO_4 \cdot 2H_2O \text{ (fixed)} \rightarrow CaSO_4 \cdot \tfrac{1}{2}H_2O \text{ (fixed)} + 1\tfrac{1}{2}H_2O \text{ (steam)}$$

—*Tonindustrie-Zeitung* (1930) **54**, 94, pp. 1467-68; 95, pp. 1483-84.

Control Screening of Aggregates. A. Janousek presents an article on the control and improvement of the granular composition of natural stone material used for concrete construction and containing river sand and gravel. He states that the customary screen analysis of aggregates gives only an idea of the maximum granular dimensions, but does not suffice for determining the shape, volume and surface of the individual granules. He illustrates the importance of this by the following example: A 32x10x3-mm. stone may not pass a 30-mm. screen opening, while a 70x14x12-mm. stone may pass a 15-mm. screen opening, although there is a difference of ten times in the volume of the two stones.

He reports on a number of screening tests he has made, giving his calculations and considering specific gravity, dimensions, volume, shape, kind, and surface area of the aggregate. Screening tests on aggregate were also made in connection with a study of strength of the concrete, and the author concludes that five screens are sufficient for practical control of concreting work, the 1, 3, 7, 15, and 30-mm. size openings being suitable for coarser materials, and the 1, 2, 5, 10, and 20-mm. size openings for finer materials. It is his recommendation that these screen sizes should be agreed upon internationally.—*Beton u. Eisen* (1930) 23, pp. 426-430.

Causes of Disturbance in Set of Alumina Cement. In concluding his discussion of causes of disturbance in the setting of alumina cement, H. W. Gonell states that upon the basis of previous considerations it is probable that the differences in the results obtained by Roscher and by himself in ref-

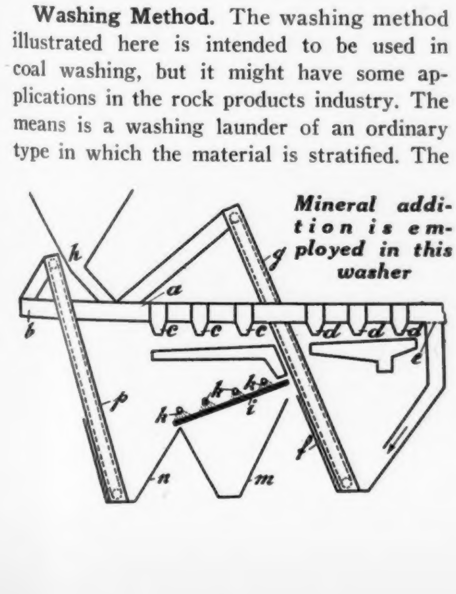
erence to the influence of the carbonic acid upon the set of alumina cement are conditioned by the differences in the lime contents of the cements investigated. New experiments resulted in verification of the results of previous investigations of the author, the correctness of which was doubted by Roscher, due to the fact that in the cements examined the carbonic acid of the air must be considered as an essential cause of disturbance in set. Surface drying out is contributory to causes of disturbance in set only, if at all, to a subordinated measure and under unfavorable conditions of storage.—*Zement* (1931) **20**, 8, pp. 164-168.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

Casting Cement Objects Having Polished and Translucent Surfaces. The process consists in casting the objects in molds of glass or other polished material of a special aluminous cement. This may consist of the whole series of silico-aluminous compounds of calcium so that the aluminous compounds preponderate and the index (silica plus alumina) divided by (lime plus magnesia) is greater than 0.6 and the iron content is less than 1.5%. The inventor states that monocalcic aluminate containing less than 5% of impurities possesses superior qualities of translucency and hardness, affording surfaces suitable for walls and flooring. The special cements, and especially the monocalcic aluminate, may be used in a thin layer to economize these expensive products and may be covered with a layer of ordinary aluminous cement, or portland cement, without waiting for the hardening of the first layer. This composition, he says, "will set well, although authorities state that mixtures of different cements are to be avoided." An advantage of the special cement described is its light color. The objects made in this way may be colored by pigments.—*Speranza Seailles nee Calogeropoulos and Jean Seailles, assignors to Alfred P. Bouquardez, Paris, France, U. S. Patent No.* 1,789,197.

Washing Method. The washing method illustrated here is intended to be used in coal washing, but it might have some applications in the rock products industry. The means is a washing launder of an ordinary type in which the material is stratified. The lower stratum is recovered in rising current classifiers on the under side of the trough. A second set of such classifiers recovers a mixed product which is sent back to the feed end for retreatment, and a clean product is discharged at the end. The suggested improvement in this method is that of adding mineral of high specific gravity to the mixture to be stratified so that the stratification is definite. This heavy mineral is taken out from the separators and washed free or otherwise cleaned of particles caught in its voids and sent back to be used over again. Hence this heavy mineral acts as a carrier for all or a part of the mineral it is desired to remove.

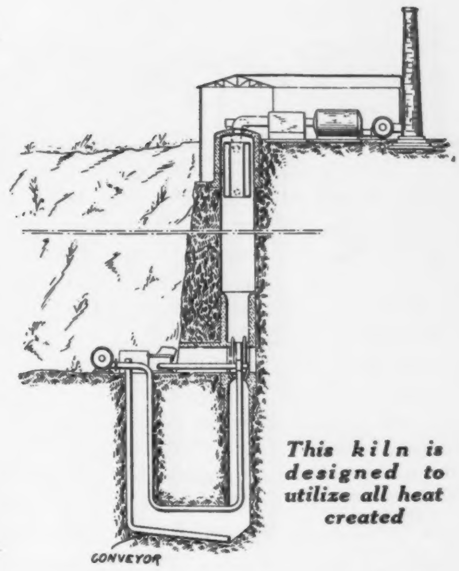


Mineral addition is employed in this washer

Quartz is suggested for the heavy mineral to be used in coal washing, but it is evident that the inventor has in mind other minerals to be used in other separations. He speaks of removing the heavy mineral added by electro-magnets which would point to the use of metallic iron.—*Antoine France, U. S. Patent, No.* 1,758,035.

Vertical Kiln. The kiln shaft shown in the accompanying illustration is sunk in a quarry parallel with the face, but the inventor says it may be sunk in a clay bank and the clay burned to be sufficiently refractory. Below this shaft two shafts and a tunnel form a U, one arm of which comes out on the quarry floor. In the upper part of the main shaft is a retort for the low temperature carbonization of coal, which is one of the several methods by which it is proposed to utilize waste heat. Coke from this carbonization may be powdered and used as fuel or the gas may be used and the coke sold. Powdered coal may also be used. The raw material is stored in silos in the ground which are warmed by waste heat from the kiln to dry them. They are crushed and ground and then blown as dust into the upper part of the main shaft through pipes that are not shown.

The burner is at the bottom of the main shaft pointing upward and it steams hot gases through it and the retort. What might be called the clinkering zone is smaller, and lined. There are tubes leading from this zone around the burner and the clinker falls through these to the U-shaft below. This clinker heats the air and fuel which comes in through the pipe shown and it is removed from the bottom of the U by a conveyor, which

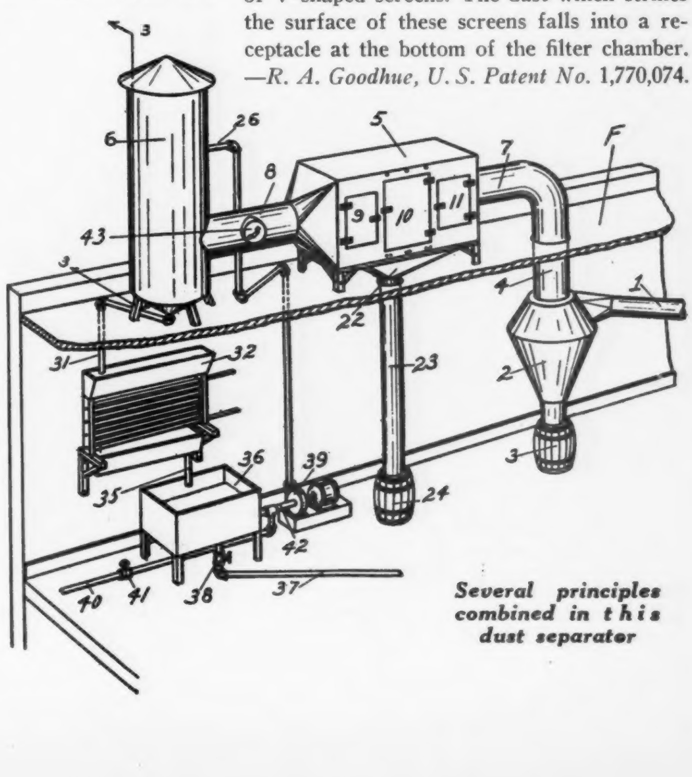


This kiln is designed to utilize all heat created

is so marked in the illustration, although the type is not stated. A short tunnel to the bottom of the shaft permits burner repairs.

After passing the coal retort the heat is drawn through a waste heat boiler by a fan. Then it is passed to silos not shown in this drawing in which raw materials and coal are dried.—*E. P. C. Girouard, Snodland, England, U. S. Patent No.* 1,791,165.

Dust Collector. The inventor of this device says it was invented for collecting powdered milk but may be used for any dust laden air. The cut shows the combination of a cyclone for removing the coarsest dust, a filter for removing the greater part of the remainder and a chamber with sprays for collecting any fine dust that may pass the filter. The claims cover the combination of spray chamber and filter and also the circulation of the spray fluid after it has been filtered to remove collected dust. They further cover the air filter which is made up of V-shaped screens. The dust which strikes the surface of these screens falls into a receptacle at the bottom of the filter chamber. —*R. A. Goodhue, U. S. Patent No.* 1,770,074.



Several principles combined in this dust separator

Portland Cement Production in May

THE PORTLAND CEMENT INDUSTRY in May, 1931, produced 14,006,000 bbl., shipped 14,222,000 bbl. from the mills and had in stock at the end of the month 29,447,000 bbl. Production of portland cement in May, 1931, showed a decrease of 18.8% and shipments a decrease of 17.4%, as compared with May, 1930. Portland cement stocks at the mills were 4.7% lower than a year ago.

The statistics here presented are compiled from reports for May, received by the Bureau of Mines, from all manufacturing plants except four, for which estimates have been included in lieu of acual returns.

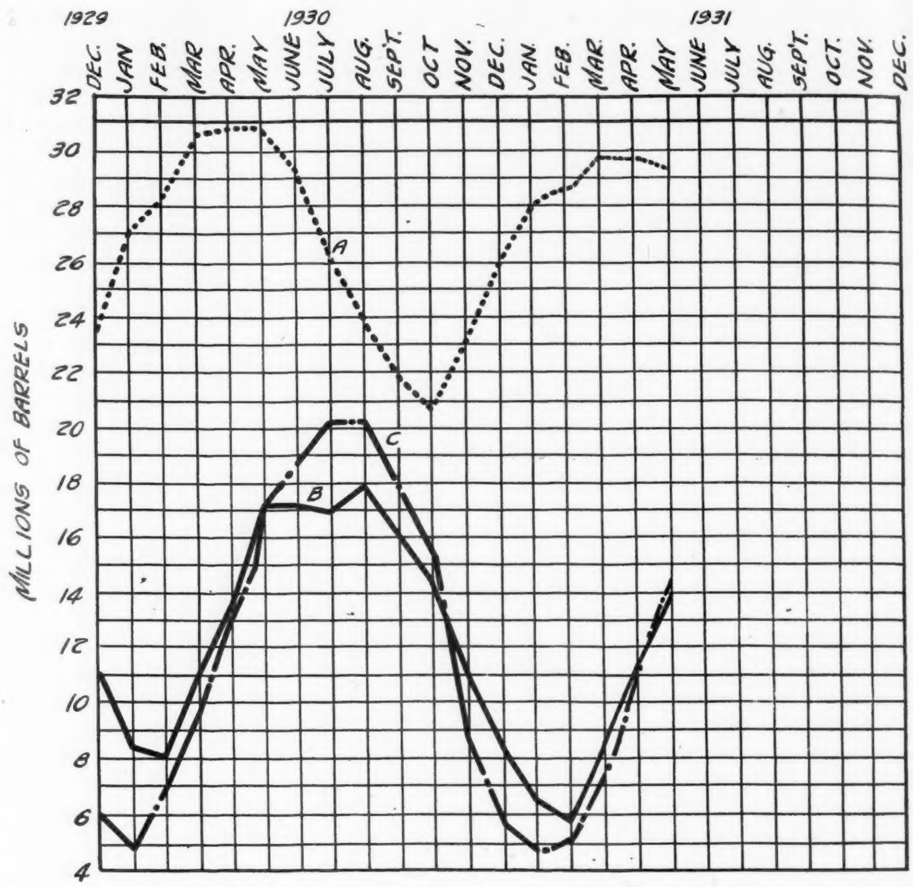
In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants at the close of May, 1931, and of 166 plants at the close of May, 1930. The estimates include increased capacity due to extensions and improvements during the period.

RELATION OF PRODUCTION TO CAPACITY

	May 1930 Pct.	May 1931 Pct.	Apr. 1931 Pct.	Mar. 1931 Pct.	Feb. 1931 Pct.
The month	78.9	62.8	52.1	36.9	29.4
12 months ended	66.2	56.5	57.7	58.6	59.7

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during March and April, 1930 and 1931.



(A) Stocks of finished portland cement at factories; (B) Production of finished portland cement; (C) Shipments of finished portland cement from factories

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN MARCH AND APRIL, 1930 AND 1931, IN BARRELS*

Shipped to	1930—March	1931	1930—April	1931
Alabama	104,750	175,601	126,501	219,593
Alaska	864	1,111	2,988	1,153
Arizona	44,917	53,821	45,312	47,083
Arkansas	86,481	74,368	130,247	183,121
California	718,840	691,790	†823,295	653,624
Colorado	57,317	42,724	85,644	70,204
Connecticut	109,085	82,833	184,816	150,380
Delaware	19,467	14,473	32,573	32,856
District of Columbia	70,893	76,232	82,913	119,153
Florida	87,400	49,466	104,898	61,526
Georgia	101,858	151,326	139,155	182,817
Hawaii	22,829	24,602	26,240	20,849
Idaho	18,305	16,408	25,650	21,558
Illinois	379,453	279,580	694,367	717,468
Indiana	201,551	130,801	386,945	256,697
Iowa	117,907	121,769	447,570	309,768
Kansas	178,877	133,354	283,917	184,369
Kentucky	72,496	97,970	118,156	197,013
Louisiana	285,435	216,170	374,620	277,366
Maine	33,975	19,556	64,470	36,091
Maryland	172,822	103,592	257,033	181,752
Massachusetts	191,190	151,893	320,443	279,032
Michigan	344,412	200,479	599,371	395,559
Minnesota	91,055	106,842	248,088	268,765
Mississippi	56,606	29,594	42,812	53,159
Missouri	264,930	221,789	529,829	406,831
Montana	18,316	19,072	37,562	24,187
Nebraska	83,042	58,027	153,348	131,416
Nevada	11,923	9,804	15,637	11,722
New Hampshire	19,963	11,868	45,594	30,884

Shipped to	1930—March	1931	1930—April	1931
New Jersey	456,109	285,359	623,867	484,331
New Mexico	23,641	23,879	35,730	30,751
New York	1,095,878	1,035,782	1,556,095	1,527,913
North Carolina	101,751	92,639	141,565	123,303
North Dakota	20,791	17,176	39,253	35,616
Ohio	425,559	308,587	823,451	491,647
Oklahoma	283,365	136,628	381,939	244,250
Oregon	101,258	84,549	72,861	105,653
Pennsylvania	700,482	458,913	1,088,646	697,081
Porto Rico	2,125	2,672	1,300	2,825
Rhode Island	45,477	25,935	73,396	73,310
South Carolina	62,241	214,460	81,105	234,756
South Dakota	28,448	28,631	36,414	56,775
Tennessee	143,103	91,664	236,120	151,183
Texas	618,703	428,923	713,051	524,419
Utah	40,937	28,086	53,292	31,633
Vermont	23,132	7,389	32,457	22,391
Virginia	120,043	118,992	148,622	162,050
Washington	214,098	174,642	276,475	211,323
West Virginia	75,381	70,953	120,687	92,214
Wisconsin	159,096	119,628	299,210	288,648
Wyoming	9,934	8,585	15,870	13,920
Unspecified	40,274	16,947	14,500	19,876
	8,758,785	7,147,934	†13,295,900	11,151,864
Foreign countries	67,215	44,066	†44,100	32,136
Total shipped from cement plants	8,826,000	7,192,000	13,340,000	11,184,000

*Includes estimated distribution of shipments from two plants in March and April, 1930; from four plants in March and April, 1931.
†Revised.

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1930 AND 1931, IN BARRELS

Month	1930—Production	1931	Stocks at end of month 1930	1931
January	10,504,000	8,129,000	9,646,000	10,384,000
February	10,008,000	7,473,000	11,572,000	11,946,000
March	13,045,000	9,586,000	13,503,000	13,318,000
April	15,025,000	11,540,000	15,164,000	*13,691,000
May	16,607,000	13,213,000	14,668,000	13,009,000
June	15,895,000	....	13,452,000	....
July	15,069,000	....	11,684,000	....
August	15,244,000	....	9,275,000	....
September	14,577,000	....	7,783,000	....
October	13,895,000	....	7,266,000	....
November	11,639,000	....	7,758,000	....
December	9,484,000	....	8,809,000	....

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN MAY, 1930 AND 1931, AND STOCKS IN APRIL, 1931, IN BARRELS

District	Production 1930—May	Production —1931	Shipments 1930—May	Shipments —1931	Stocks at end of month 1930	Stocks at end of month 1931	Stocks at end of April, 1931*
Eastern Penn., N. J., Md.	3,707,000	3,053,000	3,746,000	2,952,000	6,998,000	6,826,000	6,725,000
New York and Maine	1,176,000	1,106,000	1,191,000	1,137,000	1,847,000	2,044,000	2,076,000
Ohio, Western Penn., W. Va.	2,112,000	1,289,000	1,974,000	1,252,000	4,102,000	3,513,000	3,476,000
Michigan	1,419,000	722,000	1,229,000	825,000	2,785,000	2,482,000	2,586,000
Wis., Ill., Ind. and Ky.	2,143,000	1,913,000	2,026,000	1,743,000	4,808,000	4,378,000	4,208,000
Va., Tenn., Ala., Ga., Fla., La.	1,306,000	1,418,000	1,192,000	1,428,000	1,865,000	1,630,000	1,639,000
East'n Mo., Ia., Minn., S.D.	1,763,000	1,335,000	2,184,000	1,538,000	3,628,000	3,861,000	4,064,000
Western Mo., Nebr., Kans., Okla. and Ark.	1,360,000	1,248,000	1,390,000	1,307,000	1,807,000	1,827,000	1,885,000
Texas	630,000	600,000	620,000	644,000	836,000	734,000	777,000
Colo., Mont., Utah, Wyo., Ida.	314,000	296,000	290,000	300,000	563,000	596,000	600,000
California	926,000	699,000	980,000	730,000	1,077,000	1,027,000	1,058,000
Oregon and Washington	393,000	327,000	402,000	366,000	575,000	529,000	569,000
	17,249,000	14,006,000	17,224,000	14,222,000	30,891,000	29,447,000	29,663,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1930 AND 1931, IN BARRELS

Month	1930—Production	—1931	1930—Shipments	—1931	Stocks at end of month 1930	Stocks at end of month 1931
January	8,498,000	6,595,000	4,955,000	4,692,000	27,081,000	27,759,000
February	8,162,000	5,920,000	7,012,000	5,074,000	28,249,000	28,612,000
March	11,225,000	8,245,000	8,826,000	7,192,000	30,648,000	29,676,000
April	13,521,000	11,245,000	13,340,000	11,184,000	30,867,000	*29,663,000
May	17,249,000	14,006,000	17,224,000	14,222,000	30,891,000	29,447,000
June	17,239,000	......	18,781,000	......	29,364,000	......
July	17,078,000	......	20,153,000	......	26,289,000	......
August	17,821,000	......	20,299,000	......	23,824,000	......
September	16,124,000	......	18,083,000	......	21,889,000	......
October	14,410,000	......	15,599,000	......	20,697,000	......
November	11,098,000	......	8,784,000	......	23,056,000	......
December	8,480,000	......	5,688,000	......	25,883,000	......
	160,905,000	......	158,744,000	......	......	......

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN MAY, 1930 AND 1931, IN BARRELS

District	1930—Production	—1931	Stocks at end of month 1930	Stocks at end of month 1931
Eastern Pennsylvania, New Jersey, Maryland	3,543,000	3,004,000	2,340,000	1,923,000
New York and Maine	1,067,000	1,028,000	986,000	1,403,000
Ohio, Western Pennsylvania, West Virginia	1,988,000	1,188,000	1,749,000	1,634,000
Michigan	1,204,000	577,000	1,847,000	1,679,000
Wisconsin, Illinois, Indiana and Kentucky	2,197,000	1,685,000	2,544,000	1,706,000
Virginia, Tennessee, Alabama, Georgia, Florida, Louisiana	1,403,000	1,283,000	1,074,000	736,000
Eastern Missouri, Iowa, Minnesota and South Dakota	1,802,000	1,318,000	1,221,000	1,027,000
Western Missouri, Nebraska, Kansas, Oklahoma, Arkansas	1,272,000	1,125,000	446,000	732,000
Texas	596,000	496,000	379,000	193,000
Colorado, Montana, Utah, Wyoming and Idaho	313,000	312,000	184,000	303,000
California	858,000	854,000	1,315,000	1,262,000
Oregon and Washington	364,000	343,000	583,000	411,000
	16,607,000	13,213,000	14,668,000	13,009,000

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1930 AND 1931

Month	1930—Exports Barrels	Value	—1931 Barrels	Value	1930—Imports Barrels	Value	—1931§ Barrels	Value
January	82,387	$293,135	41,199	$115,678	201,609	$207,461	97,057	$132,937
February	64,267	217,798	25,703	88,989	114,455	119,717	22,370	26,250
March	117,563	357,896	54,599	144,579	43,622	59,981	70,532	80,686
April	57,419	200,217	40,478	116,564	140,871	178,226	54,717	61,728
May	57,423	198,170	......	......	94,696	111,998	......	......
June	82,077	223,639	......	......	55,356	74,370	......	......
July	47,082	166,577	......	......	12,404	20,973	......	......
August	49,031	167,579	......	......	35,323	39,029	......	......
September	46,594	153,384	......	......	51,096	59,721	......	......
October	62,690	190,305	......	......	75,284	84,364	......	......
November	50,495	151,555	......	......	109,124	125,448	......	......
December	38,680	134,260	......	......	44,157	59,641	......	......
	755,708	$2,454,515	......	......	977,997	$1,140,929	......	......

Exports and Imports†*

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES, IN APRIL, 1931

Exported to	Barrels	Value
Canada	2,843	$10,421
Central America	1,891	5,311
Cuba	2,963	7,212
Other West Indies and Bermuda	9,024	14,112
Mexico	4,028	13,002
South America	17,627	54,647
Other countries	2,102	11,859
	40,478	$116,564

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN APRIL, 1931

Imported from	District into which imported	Barrels	Value
Belgium	Massachusetts	16,111	$19,806
Canada	Maine and N. H.	54	$185
	Vermont	23	58
	Total	77	$243
Denmark	New York	24,204	$24,782
	Porto Rico	9,153	9,238
	Total	33,357	$34,020
France‡	New York	1,384	$3,152
Germany	New York	997	$1,727
Japan	Hawaii	2,791	$2,780
	Grand total‖	54,717	$61,728

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO, IN APRIL, 1931

	Barrels	Value
Alaska	1,248	$ 2,344
Hawaii	16,055	41,668
Porto Rico	3,472	5,586
	20,775	$49,598

*The value of exports of domestic cement is the actual cost at the time of exportation in the ports of the United States whence they are exported, as declared by the shippers on the export declarations.

†The value of imported cement represents the foreign market value at the time of exportation to the United States.

‡White nonstaining portland cement.

‖Includes 1384 bbl. white nonstaining portland cement, valued at $3152.

§Includes white nonstaining portland cement.

Retail Building Material Prices

THE figures given below, compiled by the Department of Commerce, show average prices paid May 1 by contractors, delivered.

City	Portland cement, per bbl. exclu. of cont.	Gypsum wallboard, ⅜-in., per M	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, ¾-in., per ton	Gypsum plaster, neat, per ton
New Haven, Conn.	$2.70		$19.00	$1.25	$2.25	
New London, Conn.	2.50	$25.00	18.00	1.50	3.00	$18.00
Waterbury, Conn.	3.00	30.00	20.00	1.25	2.45	20.00
Haverhill, Mass.	2.80	25.00	18.00	......	......	18.50
New Bedford, Mass.	2.80	24.00	16.50	1.75	3.00	16.50
Albany, N. Y.	2.70	24.75	15.75	......	......	17.10
Buffalo, N. Y.	3.10	25.00	18.00	1.85	2.05	14.00
Poughkeepsie, N. Y.	2.18	......	......	2.25	2.00	......
Rochester, N. Y.	2.38	22.00	20.00	2.00	2.40	16.00
Syracuse, N. Y.	2.55	25.00	13.00	2.00	1.70	15.00
Paterson, N. J.	2.40	25.00	18.00	1.50	2.10	17.50
Trenton, N. J.	1.94	25.00	18.00	1.15	1.80	17.50
Philadelphia, Penn.	2.16	......	14.50	1.75	2.60	17.50
Scranton, Penn.	2.80	......	20.00	3.25	......	19.00
Baltimore, Md.	2.10	......	13.00	2.25	2.50	14.50
Washington, D. C.	1.98	25.00	13.00	......	......	16.00
Richmond, Va.	3.10	31.00	17.50	1.95	2.45	20.00
Fairmont, W. Va.	2.80	35.00	16.00	3.10	3.50	18.00
Columbia, S. C.	2.32	35.00	12.50	1.50	2.75	15.40
Atlanta, Ga.	2.45	......	15.00	2.25	2.50	18.00
Savannah, Ga.	2.85	25.00	20.00	2.00	......	16.00
Tampa, Fla.	2.60	......	24.00	2.00	4.50	23.13
Birmingham, Ala.	3.00	......	20.00	3.00	2.50	17.00
Shreveport, La.	3.20	......	......	2.00	3.80	22.00
Erie, Penn.	2.10	22.50	16.00	2.00	......	16.00
Akron, Ohio	2.15	......	15.00	2.00	2.50	18.00
Canton, Ohio	2.95	......	16.00	2.50	3.00	......
Cincinnati, Ohio	$2.34	$24.75	$14.40	$2.63	$2.55	
Cleveland, Ohio	1.68	......	10.00	1.25	2.15	$15.00
Toledo, Ohio	3.00	22.50	16.00	2.00	2.50	15.50
Detroit, Mich.	2.60	25.00	14.80	2.03	1.95	......
Lansing, Mich.	2.15	......	18.00	2.10	......	16.00
Saginaw, Mich.	2.00	22.00	18.00	2.00	3.25	17.00
Terre Haute, Ind.	2.60	28.00	18.00	1.50	3.00	18.00
Louisville, Ky.	2.32	......	15.50	2.20	2.43	17.00
Chicago, Ill.	1.95	25.00	15.00	2.00	2.50	16.00
Rockford, Ill.	2.60	25.00	20.00	1.60	1.15	16.00
Milwaukee, Wis.	1.64	22.00	14.00	1.35	1.35	15.20
Des Moines, Iowa	......	......	20.00	1.02	......	......
Kansas City, Mo.	2.10	25.00	24.00	1.60	1.86	15.00
St. Louis, Mo.	2.10	......	18.00	1.35	1.00	18.00
St. Paul, Minn.	2.15	24.00	17.00	1.40	2.08	17.00
Grand Forks, N. D.	3.00	......	25.00	2.60	......	20.00
Sioux Falls, S. D.	2.40	......	24.00	1.25	2.25	15.50
Wichita, Kan.	1.60	25.00	20.00	1.25	......	15.00
Tulsa, Okla.	1.90	22.50	22.00	.85	2.60	18.00
San Antonio, Tex.	2.43	......	20.00	2.25	2.35	19.15
Tucson, Ariz.	3.37	......	30.00	1.25	2.50	17.10
Los Angeles, Calif.	2.30	......	24.70	1.85	1.90	15.20
San Francisco, Calif.	2.42	......	22.50	1.40	1.60	16.90
Seattle, Wash.	1.60	35.00	22.00	1.40	1.90	20.00

Safety Trophies Dedicated

Splendid Ceremonies Mark Unveiling of Association Monuments at Member Plants

THE SEASON for dedicating Portland Cement Association safety trophies at the successful cement mills opened on May 14, with a celebration at the white cement plant of the Medusa Portland Cement Co. at York, Penn. Similar occasions are to follow in rapid succession until fall—forty-three of them altogether, comprising what is expected to be the most interesting group of meetings yet held in the American cement mills. Hundreds of public officials and industrial celebrities are participating and many thousands of persons will witness the ceremonies and take advantage of the oportunity to inspect the mills and quarries.

Unveiling of trophy at plant of Wellston Iron Furnace Co., Superior, Ohio

Families of cement workers, almost without exception, come to the mills to help celebrate, a year without a dollar missing from a pay envelope or a day lost because of a needless injury. Many of them see the mystery of cement making for the first time and obtain a better appreciation of the hazards which surround the wage earners. Neighbors and townspeople also attend in large numbers, eager to pay their respects to a local institution accorded national honors. Local newspapers are generous with space.

These trophy dedications are not prearranged formal affairs. The ceremonies and recreation features are arranged by the local mill organizations as seems most appropriate to them. Consequently no two celebrations are alike and each reflects some of the individuality of the local committee. All of these occasions have one common characteristic—that of unusual interest and enthusiasm. They are now taking place almost daily and on some days recently two or three dedication parties have been held.

At the York Plant

On the afternoon of May 14, the Spring Valley band of York, Penn., opened the celebration at the white cement plant of the Medusa Portland Cement Co. Employes of the mill and accompanying quarry marched from the kiln building to a block of seats reserved for them in front of the speakers' stand. The program of the ceremonies was as follows:

Flag Raising. Song, "Star-Spangled Banner."

Invocation—Rev. F. W. Leiry, York, Penn.

Address of Welcome—W. L. White, Jr., assistant general manager, Medusa Portland Cement Co.

Presentation of the Trophy—A. J. R. Curtis, secretary, Committee on Accident Prevention, Portland Cement Association.

Unveiling of the Trophy—Phyllis Marie Myers.

Acceptance of the Trophy—R. J. Landis, superintendent, York plants, Medusa Portland Cement Co.

Address—J. B. John, president, Medusa Portland Cement Co.

Presentation of Joseph A. Holmes Award to the Medusa Co.—M. W. von Bernewitz, mining engineer, U. S. Bureau of Mines.

Acceptance—J. B. John, president, Medusa Portland Cement Co.

Address—Harry D. Immel, director, Department of Labor and Industry, State of Pennsylvania.

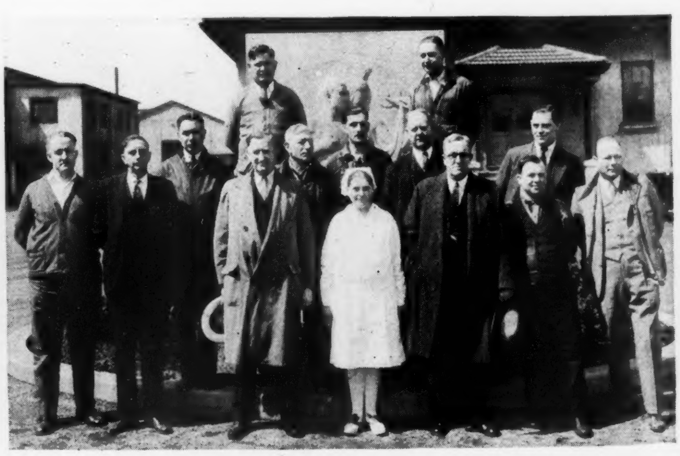
Address—E. J. Maguire, vice-president, Medusa Portland Cement Co.

Concluding Remarks—W. L. White, Jr., assistant general manager, Medusa Portland Cement Co.

In presenting the trophy on behalf of the Portland Cement Association, Mr. Curtis complimented the Medusa organization highly on its very enviable reputation for safe operation. Mr. Curtis stated that the winning of the trophy by seven of the eight Medusa plants during the same year constituted a new record for the industry. In commenting on the progress of accident prevention work Mr. Curtis recalled forty of the forty-six mills with perfect records in

At York, Penn., plant of Medusa Portland Cement Co.

Left to right: E. J. Maguire, vice-president and treasurer, Medusa Portland Cement Co.; M. W. von Bernewitz, U. S. Bureau of Mines; J. B. John, president, Medusa; A. J. R. Curtis, Portland Cement Association; W. L. White, Jr., assistant general manager, Medusa; R. J. Landis, superintendent, York plant; W. M. Powell, safety director, Medusa



At Great Lakes plant, Buffalo, N. Y.

Front row, left to right: D. W. Yike, chief chemist; C. J. Smith, chief clerk; T. J. Huston, mill foreman; L. A. Hughes, nurse; D. C. Hammond, mill foreman; P. Jordan, machine shop foreman; J. B. Zook, chief engineer. Second row, left to right: J. A. McGraw, yard foreman; G. Cluchey, labor foreman; Th. Sumner, carpenter; G. H. Smith, electrical foreman; Joe McHugh, secretary. Rear row, left to right: C. F. Stevenson, packhouse foreman; L. R. Lutz, mill foreman

Mr. Curtis speaking at Wampum, Penn.

1930 suffered 406 lost time and 14 fatal accidents five years ago.

Superintendent Landis accepted the trophy gratefully on behalf of the employes and gave assurance that they would strive valiantly to continue the perfect record. President John traced the progress of safety sentiment in the cement industry and exhibited great pride in the accomplishments of his own company in this regard.

Mr. vonBernewitz, as personal representative of Scott Turner, director of the U. S. Bureau of Mines and of the Joseph A. Holmes Memorial Association, presented the Joseph A. Holmes award, carrying with it a very distinguished citation of the Medusa Portland Cement Co. for operating seven of its eight plants for more than a year without accident.

Wampum Crowds Witness Ceremonies

On Friday afternoon, May 15, a crowd of about one thousand persons assembled on the grounds before the Crescent plant of the Medusa Portland Cement Co., at Wampum, Penn., to witness the dedication and unveiling of the Portland Cement Association trophy awarded to that plant for a perfect safety record during 1930. As in the case of the York celebration, a group of the principal Medusa operating officials were present to take part in that program.

The program opened with the "Star Spangled Banner" which was played by the band and sung by the assemblage as the plant flag was raised. After the invocation by Rev. J. G. Bingham of Wampum, the trophy was presented by A. J. R. Curtis and unveiled by Clara Campbell, small daughter of Lloyd Campbell, one of the safety committeemen. W. P. Rice, superintendent of the Wampum plant, accepted the handsome monument on behalf of the plant organization which, he promised, would require plenty of space for further inscriptions.

President J. B. John made an inspiring address to the workmen and pledged the continued interest of the company management in stamping out injuries. He asked the children, of whom several hundred were present, to keep continually reminding their fathers to avoid dangers at their work. Rev. F. A. Maloney, pastor of St. Monica's church at Wampum, talked to the men about the moral aspects of safety and warned them to remain ever on the lookout. Hon. George T. Weingartner, state senator from the Wampum district, spoke of the splendid reduction in accidents in industry in general and lauded the extraordinary record of the cement mills and of the Crescent plant in particular. E. J. Maguire, vice-president of Medusa, concluded the list of speakers. W. L. White, Jr., acted as chairman and master of ceremonies.

The trophy at the Wampum plant was placed within a beautifully landscaped oval with a concealed floodlight to illuminate it by night.

Security Plant Celebrates May 21

The Security plant of the North American Cement Corp., at Hagerstown, Md., dedicated its Association safety trophy on Thursday afternoon, May 21. Approximately eight hundred employes with their families, friends and neighbors assembled in the park adjoining the plant, where the exercises took place.

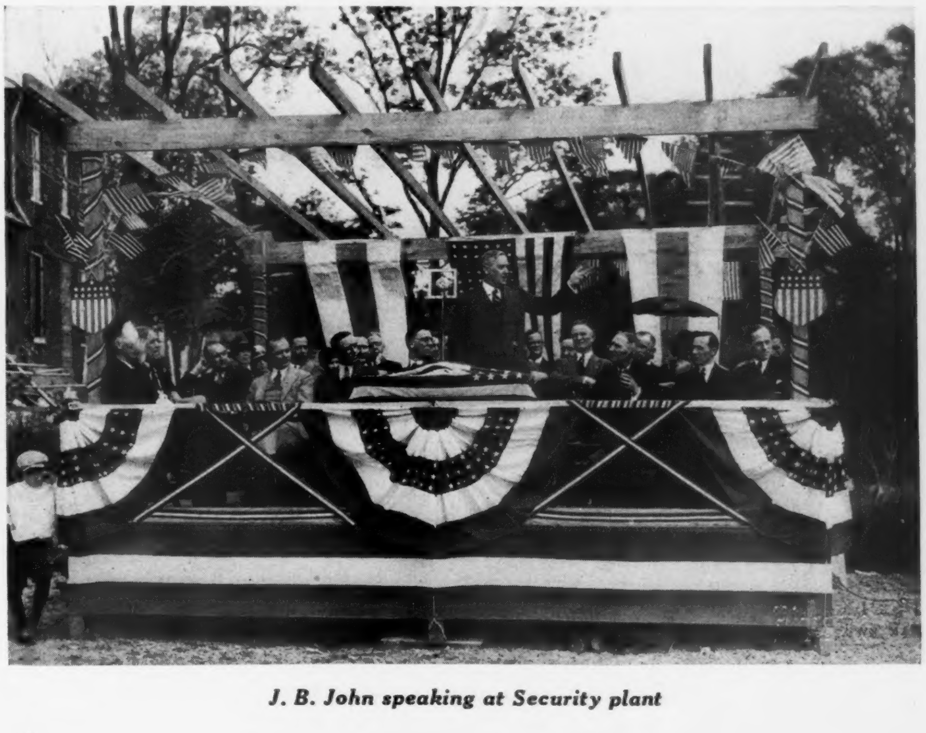
Speakers included J. B. John, president of the Medusa Portland Cement Co. and chairman of the Committee on Accident Prevention and Insurance of the Portland Cement Association; E. S. Guth, district manager, North American Cement Corp.; Loring A. Cover, former president, Security Cement and Lime Co., and Hon. Millard F. Tydings, United States senator from Maryland.

John J. Porter, vice-president and general manager of the North American Co., presided. As the band played the national anthem the customary flag-raising ceremony was observed, after which Rev. Paul E. Cooper of Hagerstown pronounced the invocation. In his opening address Mr. Porter warmly praised the safety work of the Security employes and also gave credit to the Accident Prevention Committee of the Portland Cement Association for its untiring efforts to promote safe operation.

In presenting the trophy Mr. John stated that only a few years ago the cement industry did not believe it possible for any plant to operate as long as a year without as much as one lost time accident, but that gradually the records improved and that finally, in 1930, 46 mills had accomplished what previously had seemed to be impossible. At the conclusion of Mr. John's remarks the monument was unveiled by Geneva DeFablio and Betty Mae Leiter, small daughters of employes of the plant.

Mr. Guth accepted the trophy gratefully, on behalf of the North American Cement Corp. and its employes and in complimenting his men, expressed the belief that they would be able to win again in 1931. Loring A. Cover, president of the company which formerly operated the Security plant, and a director of the North American Cement Corp., was loudly acclaimed by old friends as he arose to speak.

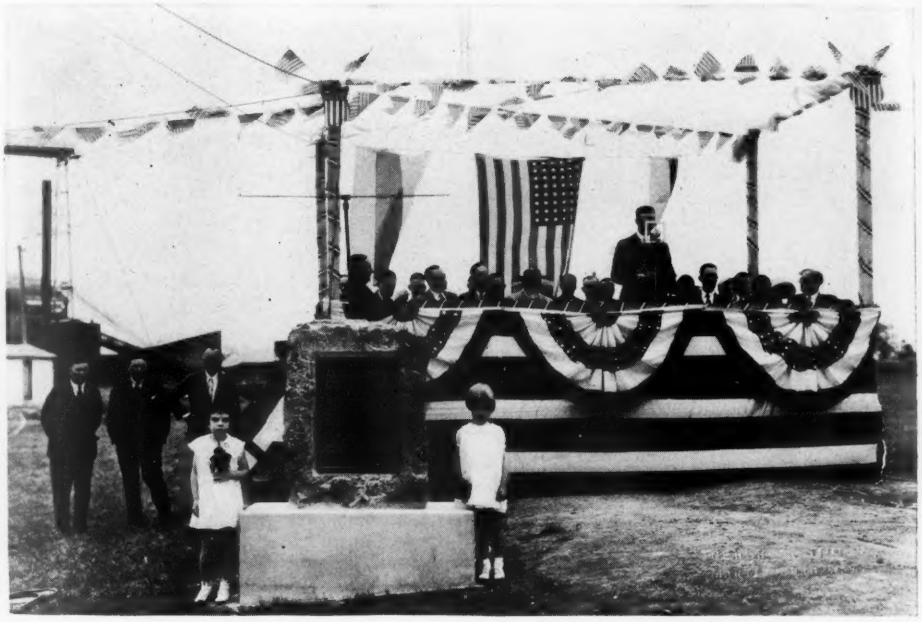
Mr. Cover recalled the interesting history



J. B. John speaking at Security plant

of the Security plant and told of its struggles during the early days, its long climb toward success and finally its outstanding prominence in the matter of safe operation. Senator Tydings treated his audience to one of those masterly addresses for which he has long been noted in the Senate. He saw as a most hopeful sign the splendid cooperation between management and men of the plant and predicted that common sense would soon end the present period of depression.

A telegram was read from President F. W. Kelley expressing his desire for a successful celebration. Mr. Kelley complimented the organization for its achievement and expressed his regrets for being unable to be present. Following the dedication program visitors were shown through the plant under the direction of A. W. Cox. The band led the assemblage to the baseball grounds where they participated in various forms of amusement.



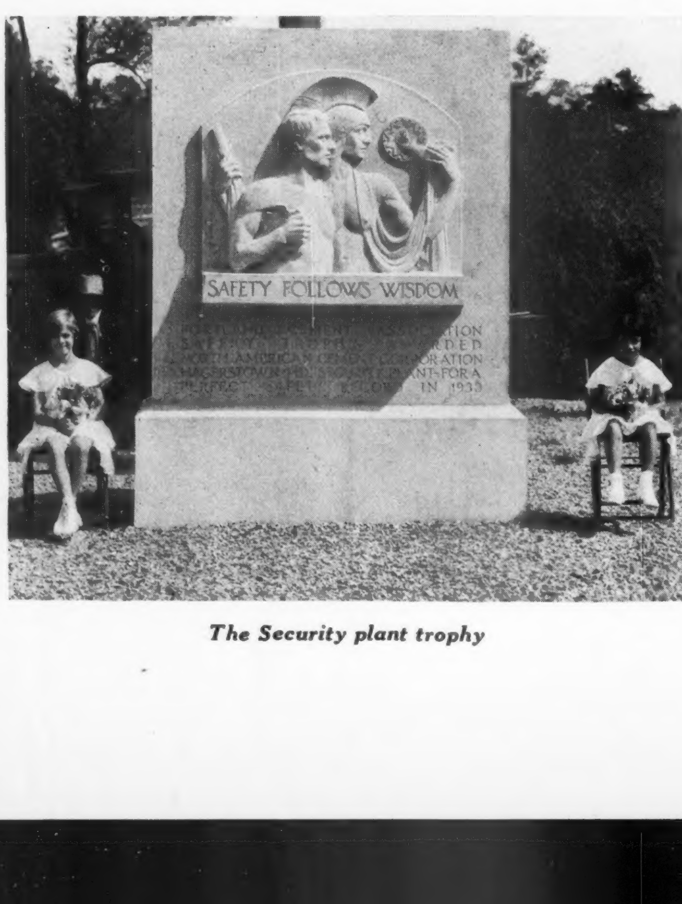
Dedication of North American trophy at Berkeley plant

Port Colborne Plant Rededicates

At the Port Colborne (Ontario) plant of the Canada Cement Co. a very interesting re-dedication ceremony took place on Wednesday, May 27. An organized procession of three hundred employes marched from the plant along beautiful Maple Avenue to the King's Highway, reaching the parked plaza which surrounds the trophy.

Many men of prominence attended the ceremonies. Among them were J. D. Johnson, president, Canada Cement Co.; A. C. Tagge, director and past chairman of the committees on accident prevention and insurance, Portland Cement Association; F. B. Kilbourne, general superintendent; V. C. Moynes, sales manager, Toronto; R. B. Morley, general manager, Industrial Accident Prevention Associations of Ontario; A. H. Webster, inspector, Department of Mines, Toronto; J. B. Zook, chief engineer and safety director, Great Lakes Portland Cement Corp., Buffalo, N. Y.; W. G. H. Cam, power and safety engineer, Canada Cement Co.; C. W. Edmunds, construction engineer; J. H. Legate, superintendent, Plant No. 5; E. W. Bailey, superintendent, Lakefield, Ont., and representatives from the municipality of Port Colborne and the county of Welland.

These visitors took their stand on the lawn in front of the home of Superintendent L. M. McDonald, who was master of ceremonies for the occasion, and the group applauded enthusiastically as the long parade came abreast of them. The employes of the plant paraded in departments; in the order of the production process of Canada Cement, starting with the quarries, and each department carrying a banner stating the number of days that department had operated since its lost-time accident. The whole organization was headed by two employes carrying a large banner notifying the world that it was 774 days since the last accident on the whole plant.



The Security plant trophy

Following the parade, employes were grouped in a semi-circle about the trophy and Mr. McDonald opened the ceremonies. After he welcomed the guests he introduced R. M. Morley, general manager of the Industrial Accident Association. Mr. Morley said that there were 69,257 industrial accidents reported to the Workmen's Compensation Board of Ontario during 1930 to which he was proud to say the Port Colborne plant had not contributed a single case. He stated that while attending the meetings of the Committee on Accident Prevention of the International Labor Office at Geneva, Switzerland, last summer, he mentioned with a great deal of pride the record of the Port Colborne plant. Mr. McDonald introduced as the next speaker, A. C. Tagge, president of the Canada Cement Co. for three years and for many years connected with the company in various capacities. Mr. Tagge is a director of the Portland Cement Association and was chairman of its committee on accident prevention for a number of years and represented the association at the ceremony. Mr. Tagge said in part:

"It is a new thing for me to represent any other organization than the Canada Cement Co., but I can assure you that I am greatly pleased to have the opportunity of representing the Portland Cement Association today, and of officially re-dedicating this trophy for your clear record during 1930. The Portland Cement Association takes a remarkable interest in safety and it is a fine thing to mark the enthusiasm of its members. Ten or more years ago safety was a newer activity and men did not feel the same towards it as they do now, but the wonderful records that were made and won by the member plants convinced the officials of its worth and there has never been any question regarding the amount of the appropriations made to carry on the work of safety. In these times of financial tightness, many budgets were reduced by the Association, but the budget for the accident prevention work was increased—that will show you the attitude of these men towards

you and your work." When the applause following Mr. Tagge's talk had subsided, Mr. McDonald introduced the next speaker.

"Of all his official actions," he said, "it is extremely gratifying and most pleasing that on his first visit to our plant as president of our company, our president should accept and re-dedicate this trophy which we have won for the second time. Today he comes to us for the first time as president and we welcome him and assure him of our hearty support and co-operation to the utmost. He comes in his official capacity to accept from the Portland Cement Association this award, and it gives me the utmost pleasure to introduce J. D. Johnson, president and general manager of the Canada Cement Co."

The sincerity with which Mr. Johnson spoke was plainly discernible when he said, in part, "It is with a great degree of pride and satisfaction that we accept from the Portland Cement Association the re-dedication of this trophy." The speaker paid a glowing tribute to the safety work of A. C. Tagge, "and," he said, "I can assure him that he will always be welcome to us in any capacity."

"I wish," Mr. Johnson continued, "to congratulate each and every one in this gathering today. I say 'each and every' because every individual has done his share to make possible this award—without the full co-operation of all of you, the record would not have been made. No heads of any company or executives of any organization could have helped thrilling with pride, on viewing the procession you made past us a short while ago, each department carrying banners stating the number of days you operated without an accident. No executive could help feeling pride when he saw, in some cases, where you had gone over 3600 days—ten long years without a lost-time accident, and it is most impressive to note that your whole plant has operated for over two years without accident."

While introducing the next speaker, Mr. McDonald said, "To prove to you that our safety work is international and that our record goes far afield, I will now call on a gentleman from a portland cement plant across the line that has even a greater record than ours, for they have won the Portland Cement Association trophy for two years in succession. I am happy to present J. B. Zook, chief engineer and safety director of the Great Lakes Portland Cement Corp., Buffalo, N. Y.

Mr. Zook in a most interesting manner outlined the fundamentals of plant safety, stressing the fact that each individual on the pay roll was as important in safety work as any other.

Other speakers were Mark Vaughn, member of the Provincial Parliament of Ontario and H. G. Jacobsen, former manager of the Bureau of Accident Prevention and Insurance of the Portland Cement Association.

Sand and Gravel Association Safety Contest Winners

Trophy awarded to Potts-Moore Gravel Co., Waco, Texas

Trophy awarded to Stewart Sand and Material Co., Kansas City, Mo.

THE PRELIMINARY REPORT of the United States Bureau of Mines, bearing upon the results of the 1930 safety contest among members of the Association, was submitted at West Baden. Plants participating in the contest were divided into two classes: those which worked 100,000 man-hours or more, and those which worked less than 100,000 man-hours. The winner of the trophy awarded by Rock Products for the larger plants was the Missouri River plant of the Stewart Sand and Material Co. of Kansas City, Mo. This plant worked 108,753 man-hours and had no lost-time accidents. The winner of the trophy for the small plant was the Waco plant of the Potts-More Gravel Co. of Waco, Texas. This plant worked 79,881 man-hours and had no lost-time accidents.

Those plants having perfect safety records but which failed to win the trophy because other plants reported larger man-hours, will receive a certificate of merit. Out of the 76 plants which completed the contest, 32 had no lost-time accidents.—*National Sand and Gravel Bulletin.*

Bay Bridge Mill Unveils Award

At the Bay Bridge mill of the Medusa Portland Cement Co., located near Sandusky, Ohio, the dedication and unveiling of the Portland Cement Association safety trophy took place on Wednesday afternoon, May 27. The beautiful park prepared by the company at the entrance to the plant had been completely sodded and planted with a variety of trees and shrubs. As a centerpiece or place of honor, the handsome cast stone safety monument was erected with a fountain and reflecting pool before it and large semi-circular concrete seat and flagpole back of it.

The program opened with a parade of the employes from the mill to seats near the trophy, led by the Sandusky High School band. After the flag raising ceremony and invocation by Rev. John Braun, W. L. White, Jr., assistant general manager of the company, made the address of welcome and the trophy was presented by A. J. R. Curtis of the Association. It was then unveiled by Joyce Kleinoeder, daughter of one of the employes.

Superintendent A. J. Little accepted the trophy on behalf of his men, referring to the long climb and steady progress made from an unenviable position with respect to accidents to a clear record in 1930 entitling the plant to the Association award. J. B. John, president of Medusa, complimented the men on this record and in discussing with them present commercial conditions in the industry stated that only as a last resort would the Medusa company cut wages.

Hon. Wm. L. Fiesinger, member of the state legislature from the local district made a splendid address, decidedly optimistic in tone and E. J. Maguire, vice-president of Medusa spoke of the help which women can give to men employed in industry. A large party of employes from the Medusa general offices in Cleveland were present and a number of groups inspected the plant after the ceremonies.

Wellston Also Celebrates

On the same day as the celebrations at Port Colborne and Bay Bridge, the Wellston Iron Furnace Co. also dedicated the trophy won by its cement plant at Superior, Ohio. John A. Blank, general superintendent of the Superior plant, presided as chairman. The program opened with stirring selections by the American Legion band. Rev. E. D. Barton of Superior offered the

invocation. Mr. Blank then introduced Congressman T. A. Jenkins, who highly complimented the employes and management and saw much encouragement in the fine progress that is being made in the reduction of industrial accidents.

Judge Daniel C. Jones of the Lawrence County Common Pleas Court also spoke enthusiastically and F. E. Sheward, sales manager of the Wellston company expressed his appreciation to the plant employes for their loyal co-operation. The trophy was then presented by Stanley Owens, safety engineer of the Portland Cement Association. Misses Goldie Diefenderfer and Jean Sheward, daughters of the plant superintendent and the sales manager, then unveiled the trophy.

The speech of acceptance was made by Superintendent V. C. Diefenderfer. A large attendance of local townspeople as well as nearby alumni of Ohio State University made the occasion of more than usual interest. The trophy was erected on a recently completed triangle in the town on which was also unveiled, during the same occasion, a tablet to Dr. George W. Rightmore, former president of the university, who was born on that spot.

Discontinuation of Special Cement Bulletin

RECENT inquiries indicate that there is still some misunderstanding as to how to obtain the material formerly issued monthly in the special cement bulletin of the Bureau of Foreign and Domestic Commerce, which was reported in the June 6 issue of Rock Products as discontinued with the May issue. The bulletin regularly carried United States statistics for the month preceding its preparation—that is, the issue dated February 1 was prepared during January and carried December figures. The bulletin was a compilation from early figures and was subject to revision; it was issued to give customs returns as early as possible to those interested. Its value has practically disappeared with the decline in foreign cement trade.

However, even small receipts of foreign cement are important in some sections, and arrangement has therefore been made to issue a monthly typed statement at a charge of $1 a year, payable to the Bureau of Foreign and Domestic Commerce.

An alternative to this arrangement is the monthly cement statement of the Bureau of Mines, which contains detailed domestic production and shipment data, together with limited returns from customs records under the following heads: Exports by countries of destination, imports by countries of origin and customs district, comparison, by months, of imports and exports with those of the preceding year, domestic cement shipped to Alaska, Hawaii and Porto Rico.

Safety Meeting at Allentown

Regional Conference of Lehigh Valley Mills Held on May 15

THE annual safety meeting of the member mills of the Portland Cement Association in the Lehigh Valley region was held at the Americus hotel, Allentown, Penn., on Friday, May 15. Marion S. Ackerman, Jr., superintendent of the Lawrence Portland Cement Co., acted as general chairman and was assisted by a local committee consisting of David Adam (Lawrence), R. B. Fortuin (Penn.-Dixie), C. P. Benner (Lehigh), F. B. Hunt (Nazareth) and C. T. Roth (Penn.-Dixie).

Convening at 1:30 p. m., with Mr. Adam presiding, the assemblage first heard the annual report of the Committee on Accident Prevention of the Association read by R. B. Fortuin, in the absence of A. J. R. Curtis, secretary of the committee. A portion of the report was as follows:

Advance in Safety

"A few years ago our industry was regarded everywhere as dangerous to life and limb, injurious to the health of the workers and undesirable as a field of employment. Today accident frequency is lower in the mills of our members than any other industry reporting to the National Safety Council; cement manufacturing is generally recognized to be without any serious occupational diseases, and the very low labor turnover during the past two or three years shows conclusively that cement making has come to be something of a preferred occupation.

"Again, accidents in the mills and quarries of our member companies were less numerous than during any previous year. Lost-time mishaps decreased 37.0% and fatalities 50.1% as compared with the previous year. The gross total lost-time accidents reported in 128 mills during 1930 was 422 and fatal accidents in this group during the same period numbered 18.

"The annual study of cement mill accidents during 1930 shows a reduction in severity as well as frequency. The number of accidents per million barrels of cement produced has declined consistently since January, 1925, when the rate was 28.8 accidents per million barrels, compared with 3.38 accidents for 1930.

"During 1930 accidents (total of all classes recorded by the association) occurred at the rate of about 3.43 per operating plant, as against an average of 5.24 per plant in 1929 and 17.89 per plant in 1926."

The first paper of the afternoon on "Methods of Investigating Accidents" was presented by Paul Haskarl, safety engineer, Pennsylvania Light and Power Co. Mr. Haskarl said in part:

Methods of Investigation

"The first step is to establish a method for securing verbal or written reports promptly from the place where the accident occurred. Men in the field, preferably those in supervisory capacity, should be instructed in the various methods for reporting accidents to the person in charge of safety work in the organization and the organization headquarters. These men also should be thoroughly instructed in just what information is essential for various classes of accidents, according to the severity or seriousness of them, and the cases in which an immediate verbal report is required and those in which a detailed written report is required.

"Having established a method for securing reports of accidents in headquarters from the field, the next step is to determine which classes of accidents require an immediate verbal report and those requiring a written report.

"*Verbal Report (by telephone)*. All fatal and serious accidents, and all near fatal and near serious accidents.

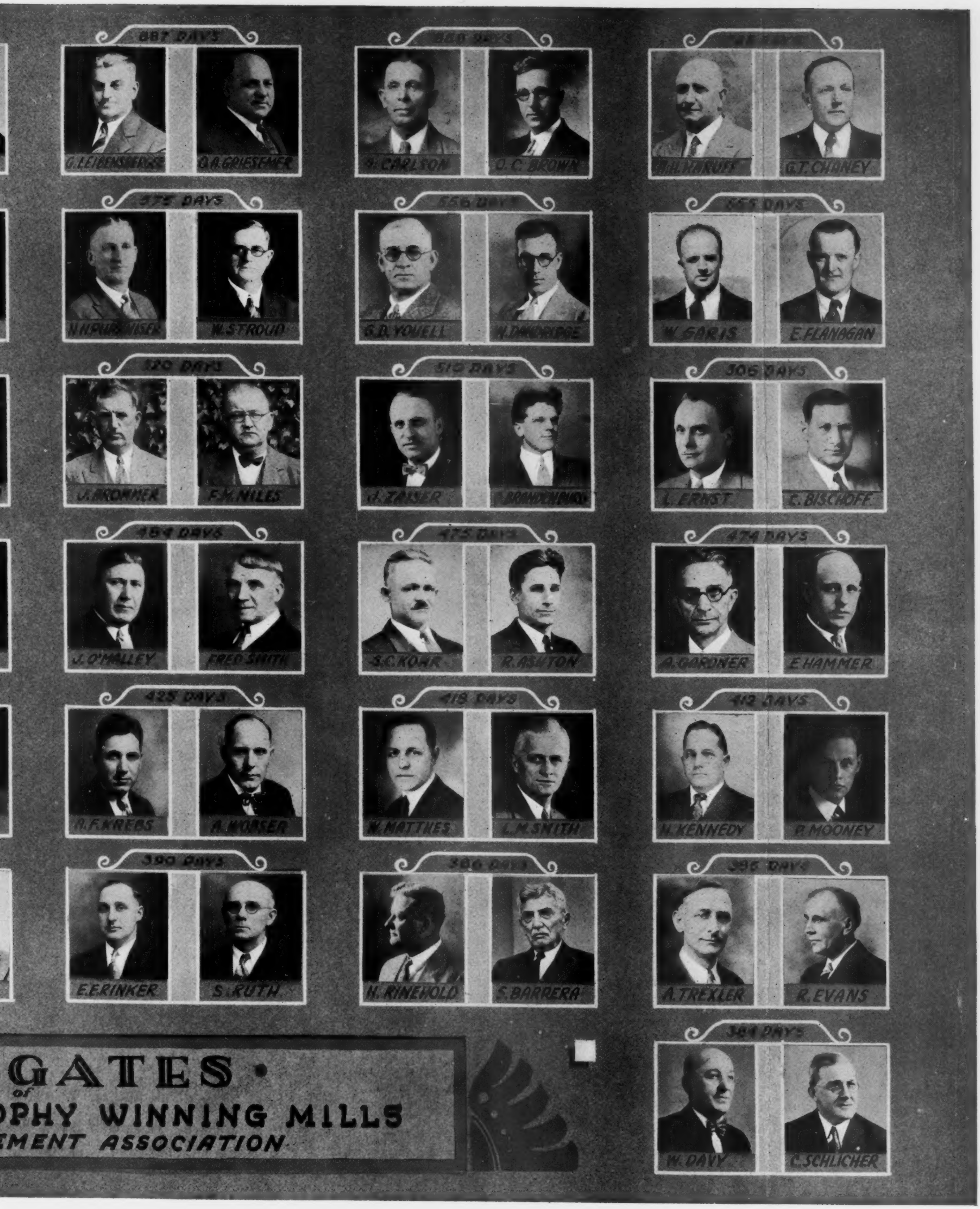
"A serious accident is one in which the attending physician states that the case is serious. A near accident is one in which a person is slightly or not injured, but violated rules or followed an unsafe practice which did not result in a fatal or serious injury to himself or fellow workmen. For example, a workman removes guards from over the gears of a conveyor line to inspect or repair the gears. After the work is completed, he starts the machinery in motion before replacing the guards and while the machinery is in motion, he attempts to oil or grease the gears, disregarding a specific rule, prohibiting oiling and greasing while the machinery is in motion; and while so doing the end of his right little finger is pinched between the gears, causing a slight or no injury to his person. However, had his finger been firmly caught in the gears, his body would have been drawn into the machinery and he injured seriously or fatally.

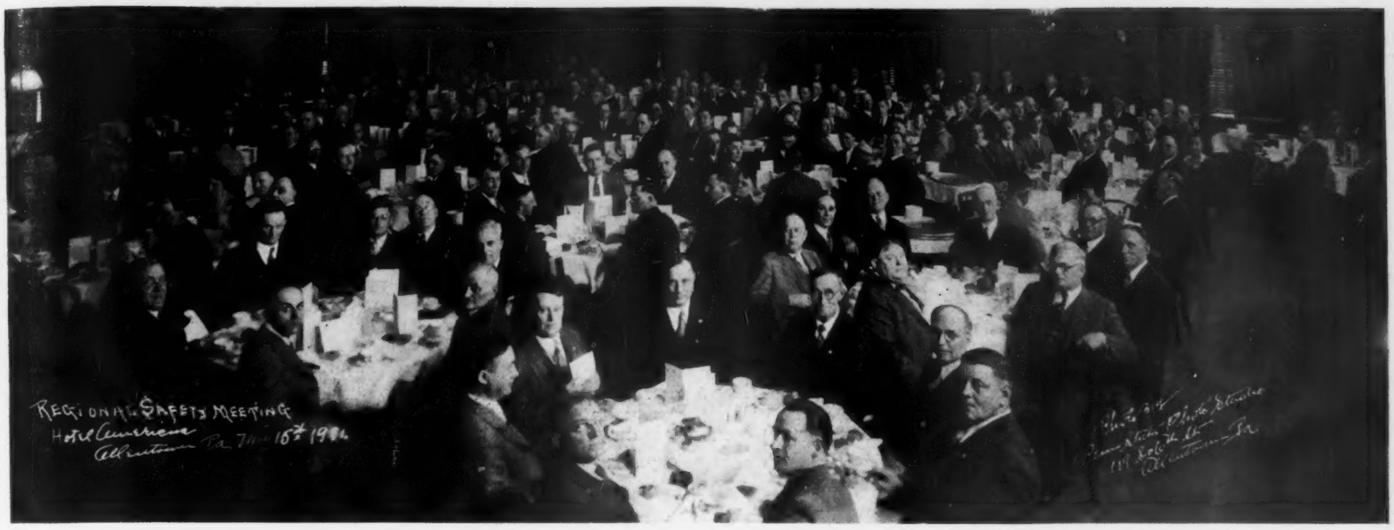
"*Written Reports.* These should be made on accidents which involve only lost-time or may only be of a minor nature, but are not serious.

"Having decided on a method for receiving reports of accidents at the headquarters and classifying them, a study of the organization for investigating and its duties is next in order. There are many methods for investigating accidents in effect, all of which may produce the desired results; however, it is the intent in this paper to discuss two methods that have proven their effectiveness as the companies using them have excellent accident records.


1574 DAYS
J.STADLER
C.GILBERT
1484 DAYS
F.C.BROWNSTEAD
J.S.BEDDALL
1001 DAYS
F.J.SNODY
E.L.JUDAY
742 DAYS
D.HAMMOND
W.LOYST
628 DAYS
W.C.BURGESS
N.NAISH
624 DAYS
L.RICE
W.GASTON
536 DAYS
JASON TODD
R.RENKERT
534 DAYS
C.van den BOSCH
J.A.BLANK
529 DAYS
G.KAUFFMANN,JR.
N.DICKENSHIED
501 DAYS
R.YOUNG
L.WOOD
499 DAYS
J.W.TEMM
W.MENNING
489 DAYS
O.OVERBY
C.GENGER
455 DAYS
H.BACKUS
O.STEIN
450 DAYS
C.BROBST
E.SCHWARTZ
433 DAYS
T.C.KUHNS
S.S.SHAFFER
405 DAYS
G.HENNING
W.STULL
398 DAYS
R.ECCLES
J.F.SMITH
391 DAYS
W.ROBINSON
J.N.BAPTIE
384 DAYS
A.A.CHANEY
A.E.MORRIS
of
1930 SAFETY TROPHY
PORTLAND CEMENT

ent to Rock Products, Vol.


687 DAYS
O.A.GRIESEMER
O.C.BROWN
G.T.CHANEY
575 DAYS
W.STROUD
G.D.YOUELL
W.DANDRIDGE
W.GARIS
E.FLANAGAN
520 DAYS
F.M.NILES
510 DAYS
J.ZAISER
L.ERNST
C.BISCHOFF
484 DAYS
J.O'MALLEY
FRED SMITH
475 DAYS
S.C.KOHR
R.ASHTON
474 DAYS
A.GARDNER
E.HAMMER
425 DAYS
A.F.KREBS
418 DAYS
W.MATTHES
L.M.SMITH
412 DAYS
H.KENNEDY
P.MOONEY
390 DAYS
E.E.RINKER
S.RUTH
H.RINEVOLD
S.BARRERA
395 DAYS
A.TREXLER
R.EVANS
384 DAYS
W.DAVY
C.SCHLICHER
GATES
of
OPHY WINNING MILLS
EMENT ASSOCIATION



Regional safety meeting of the Portland Cement Association at Allentown, Penn.

"The first method includes a safety committee composed of various department heads with the safety director or engineer as chairman. This committee should be limited to a maximum of seven members. A committee composed of department heads has many advantages, not only from an accident prevention viewpoint, but from an operating and production viewpoint as well. It is during the investigation of accidents that inefficient methods, nonobservance of rules and regulations by workmen, ineffective guarding of machinery, use of defective or incorrect tools and improper planning of work may be observed by the department heads. Furthermore, it indicates to the workmen that the department heads by actually participating in an investigation are squarely back of accident prevention.

"The second method uses an appointive workmen's committee, composed of workmen of equal rank and performing the same duties as the injured person, the chairman of which is the safety director or engineer. This committee should be limited to a maximum of five members. Such a committee is educational to the members making the investiation. They disclose many unsafe practices which have existed for a long time that they themselves may have followed, not realizing the hazards involved while doing so and which were not observed by the supervisory heads. Furthermore, they usually become accident prevention leaders in their own sphere, which is of great value to their organization.

"Immediately upon receiving a report of a fatal or serious accident, whether it be an actual or near one, the safety committee members should be notified and requested to go to the scene of the accident at once, or if it is a workmen's committee the members should be appointed without delay and instructed to hold themselves in readiness, so that when the chairman arrives they can go to the scene of the accident at once to investigate. Investigation of a fatal or serious accident, to be effective, should be made the same day on which it occurs, regardless of place or time of day.

"Upon receiving a report of an accident, the chairman should issue instructions not to disturb the physical evidence at the place where the accident occurred, unless it is imperative to do so. All workmen, including the supervisory head, who are uninjured, should be kept available at the scene of the accident, so they can be interviewed by members of the committee. Pictures should be taken of the machinery, structure or tools involved in the accident; or if this cannot be done, a pencil sketch on which the various details are shown should be made. These are valuable for use in the committee's deliberations and for educational purposes.

"The committee upon its arrival at the scene of the accident should thoroughly go over the ground, to acquaint themselves with all the physical details, after which all witnesses and others in any way involved or having facts pertaining to the accident should be interviewed individually, and written notes made of the questions and answers. The injured workman, if his condition is such that it can be done, also should be interviewed.

"A strenuous effort should be made to find the basic cause for the accident, as experience has taught us that workmen may violate a rule, disregard his superior's orders, use incorrect tools or take a chance.

"Following the completion of the investigation the committee members should review all the facts in the case and make recommendations for preventing a recurrence. The chairman of the committee should write a concise report of the accident, incorporating the committee's findings, which report should be signed by the committee members, after which the report should be submitted to the management for approval. A minority report may be written if one-third of the committee members do not concur in the conclusion reached, cause for the accident or recommendations made by the two-thirds majority.

"It is the responsibility of the committee chairman to see that the recommendations, if approved by the management, are put into effect.

"Accidents which involve only lost-time or may only be of a minor nature, which are preventable, should be investigated by a member of the safety department, together with the workman's superior, without undue delay, applying similar methods, used in investigating fatal or serious accidents, as many bad practices are discovered during the investigation of this class of accidents. Conclusions and recommendations should be put into effect, regardless of the seriousness of the injury or offense."

Benefits of Physical Examinations

Dr. A. R. Zack of Bethlehem, Penn., who has had a long experience in the practice of industrial medicine and surgery, presented a paper on "Benefits of Physical Examinations to the Employes," in which he said:

"The physician is placed in a rather precarious position with reference to rendering services in industrial cases—he is more or less in the middle in the entire arrangement, and it is absolutely essential for every ethical practitioner to satisfy the employer, the insurance carrier and the employe. However, this is not a difficult position to occupy, because good, conscientious service will usually satisfy the employer; the insurance carrier requires nothing more than a true statement of facts by everyone; and the employe seeks relief from his suffering and a re-establishment of his earning power at the earliest possible moment. How can these three conditions be successfully met?

"First, conscientious service means a thorough physical examination (not only of the immediate part of the body that has recently been subjected to some violence, but of the entire body) so that all those interested will be better able to determine the physical fit-

ness of the employe to satisfactorily perform his usual daily duties without subjecting himself or others to any unnecessary dangers, and at the same time his services will result profitably to himself and his employer.

"My contention is that the common tramp who begs from door to door, living by his wits and others' generosity, is not 'just lazy' but is a man who is physically or mentally sick and if it were possible to corral this species and make complete physical examinations of a sufficient number, we undoubtedly would find that each one would present some definite pathologic condition.

"Secondly, a true statement of facts by everyone means that the insurance companies, being especially interested in each individual who is protected under their policies, desire that each man be placed in a position which is consistent with his physical condition. In other words, all employes should be classified, not only according to their capabilities to perform certain tasks, but according to whether or not their physical qualifications permit them to perform such duties. An illustration of this is well seen in a plant in which I was employed as the examining physician. Each applicant for employment was given a thorough examination before he was given a position. If an x-ray examination was indicated, this was made. Laboratory examinations, blood pressure, blood examinations, urinalysis, and all other means at our command were employed to determine the fitness of the applicant to fill certain positions. No effort was made to exclude any man, but if any condition was found to exist that could be corrected by medical or surgical means, these recommendations were made to the employe.

"If employes were so placed that their occupations would produce no hardship on their bodies, and their physical capabilities would not be a menace to their associates, we can most certainly add to the average span of life, which has been increased enormously in the past 20 years. During this period 16 years has been added to the average span which existed at that time. This increase has been mostly because of the great decrease in infant mortality—we are now attempting to save adult lives. The insurance companies desire to know just how near normal each individual is and what duties he is capable of performing.

"Thirdly, the employe desires relief from his suffering because of the agony of pain, the inconvenience of being ill whereby ordinary daily routines are interfered with, and also because of the sudden cessation of curtailment of earning power.

"Let us all put our shoulders to the wheel of progress and get behind this latest and most humane movement—"to make our bodies safe for industry as well as to make industry safe for our bodies." The first step forward will naturally be to take inventory of our possessions (our bodies), compare each part of that body with the normal, which has been established by science, and determine what disturbing factors are interfering with normal activities, and why."

The remainder of the afternoon session was occupied with a talk on first-aid work by Dr. W. J. Fenton, American Red Cross; a round table discussion on "How to Make Best Use of National Safety Council Service," led by Col. H. A. Reninger, and a playlet entitled "A Safety Meeting of the Junior Safety Council" by members of the Junior Safety Council of Allentown, Penn.

At the annual safety dinner, M. S. Ackerman, Jr., as general chairman, introduced Morris Fortuin, general manager, Pennsylvania-Dixie Cement Corp., as the toastmaster and the latter then presided in his usual capable manner. M. W. von Bernewitz, technical expert of the U. S. Bureau of Mines, told of the Joseph A. Holmes Safety Award and was followed by H. David Sarge of Lebanon, Penn. John S. Sefing acted as song leader and an excellent orchestra was provided. The meeting was well attended. Fifteen of the Lehigh Valley plants were represented, most of the others not being in operation at this time.

Lost-Time Accident Causes

A GROUP of 600 cases of lost-time injuries was studied recently. The following interesting table shows the steps that probably would have prevented the mishaps, together with the percentage of cases. It is well worth studying.

Discipline	17.68
Instruction on safety methods of working	15.12
Warnings to be more careful	12.38
Enforcement of safety rules	11.69
Improved inspection methods	8.42
Changed or new tools or equipment	7.05
Additional personal safety equipment	6.00
Additional safeguards	4.64
Change in methods of doing work	4.47
Change in plant layout	3.94
Safety education	3.09
Physical examinations	2.23
More suitable work for employe	1.55
General discussion at safety meetings	1.03
Closer supervision of details of work	.35
Enactment of new safety rules	.18
Clean-up of plant	.18
	100%

Contractors Pump Standards Adopted

ANNOUNCEMENT IS MADE of the adoption of standards for pumps designed for use by contractors in construction work, by the Contractors Pump Manufacturers' Bureau. These standards have been approved by the Associated General Contractors of America and cover both road and diaphragm pumps. A standard rating plate bearing the seal of the Associated General Contractors will be placed on each unit manufactured in accordance with these standards.

Safety Consciousness Is Most Important Requirement

SAFETY DEVICES and guards are often looked upon as the last word in safety by the men around the shop or large industrial plant, says F. C. Crawford, Department of Commerce, in Information Circular 6427 of the Bureau of Mines. However, thorough knowledge of the details of their jobs and of the dangers attending them are even more important.

Being safety conscious is a fine attribute, as it really means knowing all about one's job. A man who is really safety conscious is one of the best and most efficient workmen in the whole plant.

There may be occasions when a man's safety consciousness will leave him for just a short time. To guard against such temporary lapses of memory and inattention, which may result from poor physical condition or worry, the proper thing to do in any operation is to guard everything where guarding is possible.

The foreman in any plant bears the immediate responsibility for the safety of his men and for efficient work. He should be able to instruct each of his men in the dangers and difficulties in his individual job.

A man who learns to be safety conscious keeps his mind open to new ideas, finds the best and safest way of doing the jobs which he has to do every day and then starts a good habit by doing the job the right way every day.

By studying accident records and trying to find the real cause of accidents some value and some education may be had from them without going through the actual danger. Every injury should be followed by an accident report.

Nearly all accidents can be avoided if people will take the trouble to think beforehand. The brain is the best safeguard there is in the world if it is propertly trained.

The head officials of any company must be squarely behind the safety movement or it generally gets nowhere. Every mine or plant should have a central safety committee headed by the highest official and composed of the heads of the main divisions in the plant. This committee should meet monthly or twice a month and the "highest official" should participate actively in these meetings.

Every mine or industrial worker should do his part when called on to serve on a safety committee and should also pass on his ideas to the committee when not serving on it. Every official should do his utmost to see that all conditions in and around the mine and plant are as nearly accident proof as feasible and should not stint personal effort to bring about this happy, and in the end, paying situation. When this spirit pervades the organization, it can be said to have acquired safety consciousness.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Concrete Pipe in Kansas City, Mo.

Successful Plant in the Town Where This Industry Fought Some Lusty Battles

Plant and yards of Kansas City Concrete Pipe Co., Kansas City, Mo.

By Develle Thatcher

KANSAS CITY, MO., has been one of the most important proving grounds for concrete pipe, especially for use as sewers. In Kansas City many hard fought battles have been staged, due to the fact that that city has been an important vantage point in the manufacture of clay products. Competing interests have not been anywise content to see the upstart concrete coming into their own town and taking away the business.

It has been a spectacular battle in some respects; and because of the issues involved it has attracted nationwide attention. Some years ago almost any meeting of the Kansas City Council was likely to provoke a debate on the relative merits of clay and concrete for sewers, and arguments and denunciations were bandied back and forth.

Most of this, of course, is now ancient history. Concrete pipe has established itself as deserving of recognition on at least an equal basis with other materials, and for a good many years concrete pipe sewers have been laid in Kansas City, the quantity of such construction gradually increasing as the years go by.

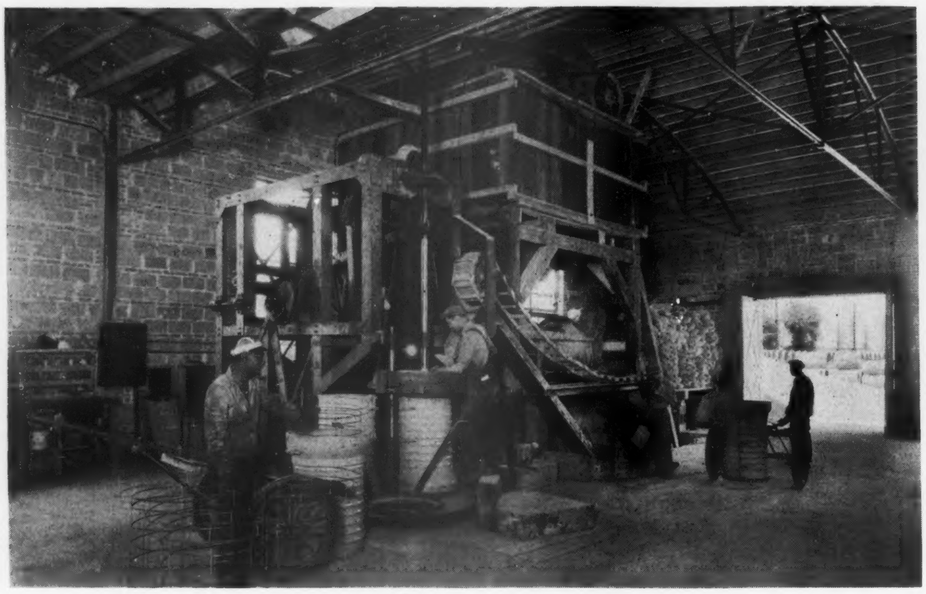
More and better salesmanship has been applied to the promotion of concrete pipe than perhaps to any other branch of the cement products industry; and a large number of well financed and prosperous pipe plants throughout the country attest the value of this promotional work. But the fact that the issue was early joined in a place like Kansas City gave evidence right at the beginning that the promoters of concrete pipe had much confidence in their product and were willing to fight valiantly for it. It is therefore a pleasure to take an occasional glance at Kansas City's progress so far as concrete pipe is concerned.

The present article deals particularly with the plant of the Kansas City Concrete Pipe Co., which has a tract of ground comprising 4½ acres in North Kansas City with a plant representing an investment of over $150,000. The larger part of the output of this company is machine-made pipe, ranging in diameters from 4 to 24 in. and in lengths of 3 ft. Sizes from 15 to 24 in. in diameter are made in extra strength design for deep fills, and the same pipe in the same sizes is also sold in considerable quantities for culverts and is guaranteed to meet all national and state specifications under which it is sold.

The pipe is made on a McCracken packerhead machine, manufacturing pipe with ribs on the outer surface to give it increased strength.

Raw materials are transported to the plant by truck and also by freight cars, there being a railway siding running directly past the east entrance to the factory. The conveyor line in the plant keeps the mixer supplied with these raw, dry materials, and the mixed concrete is discharged into the elevator boot of the machine. From that point to the completion of the manufacturing cycle, the operation is automatic. The elevator lifts the mixed concrete above the mold which stands on the revolving table, depositing it in the circular batch hopper, just above the mold.

The concrete feeds automatically into the mold when the revolving packer reaches the bottom of its downward stroke. At this point, the auxiliary bell packing head is at its top position making the bell or socket of the pipe. This operation requires from five to seven seconds. At the same time, the wall packer on the main vertical shaft is



Where the pipe are made

packing the shoulder above the socket. Then, the two packers draw apart, the bell packer moving out of the finished socket, and the wall packer rising through the pipe, packing the wall as it rises. As the packer clears the mold, the surplus material is returned to the hopper and becomes a part of the material for the next pipe.

The mold table moves one-third of its circumference at each cycle of pipe manufacture, placing an empty mold under the batch hopper for a repetition of the operation, while the cart man lifts the completed pipe, in its mold, from the machine and takes it to the curing room.

Measuring Hoppers

Butler bin measuring hoppers assure a correctly proportioned mix of sand and crushed rock, the ratio being one part portland cement to two parts clean sand and one part Bethany Falls limestone rock.

The moment each pipe is formed it is conveyed by rubber tired cart to one of the curing rooms where the jacket is taken off and it is left standing on the floor to cure.

The Kansas City firm manufactures from 2000 to 3000 ft. in a 10-hr. day. The curing room has a smooth and level concrete floor. An overhead pipe line tapped at intervals with spray nozzles provides a fine water mist in a steam-laden atmosphere to accomplish the curing.

There are four curing rooms 25 by 100 ft. each. The sections of pipe are allowed to stand for approximately 3 hours, at which time the spray of water is applied by means of White Showers spray nozzle equipment. This shower is repeated at one and two hour intervals, for a period of several minutes each time, during the indoor curing time of 36 hours.

A temperature is maintained of approximately 80 deg. F. The pipe are then transported to the storage yard where they are kept moist for the next eight or ten days.

Tests are made of each day's run by means of modern testing equipment. When the pipe are fourteen days old, they are given a three-edge compression test and hydrostatic test.

Assembling the Cages

Most of the pipe for culvert work are reinforced with cold drawn steel wire. A department 25 by 100 ft. provides facilities for assembling the cages. Wire the height of the pipe is rolled off and fed into a motor driven Hendley-Whittemore bending roll which gives the strips the proper curvature.

The ends of these strips which are cut off at different lengths according to the size of pipe they are to reinforce are joined together by means of an Economy spot welding machine. The bell part of the cage is curved by hand.

Because of the exactness of manufacture of these pipe, this concrete product is accepted in the city's department of public works specified for both sanitary and storm sewers; with only a few exceptions it is bid as an alternate by contractors along with other materials for sewer construction.

Gus Main, president of the Kansas City Concrete Pipe Co., is doing a good job selling the advantages of concrete pipe to the departments of public works in Kansas City and surrounding towns. Some of his talking points are:

1. Concrete used in Kansas City pipe is equivalent to better than 5000 lb. per sq. in. cylinder crushing test.

2. True to dimension. Each pipe is circular and not warped; the opening through the pipe is concentric with the outside, and not out of round. Thus the pipe becomes self-centering when laid up.

3. National specifications allow 8% absorption but Kansas City concrete pipe on official tests usually runs less than 4%.

4. Roots cannot enter pipe to cause stoppage, because of tight cemented joints.

5. Concrete pipe line can be cut to provide connections without removing pipe from line or cracking and can be cemented to provide a perfectly tight joint.

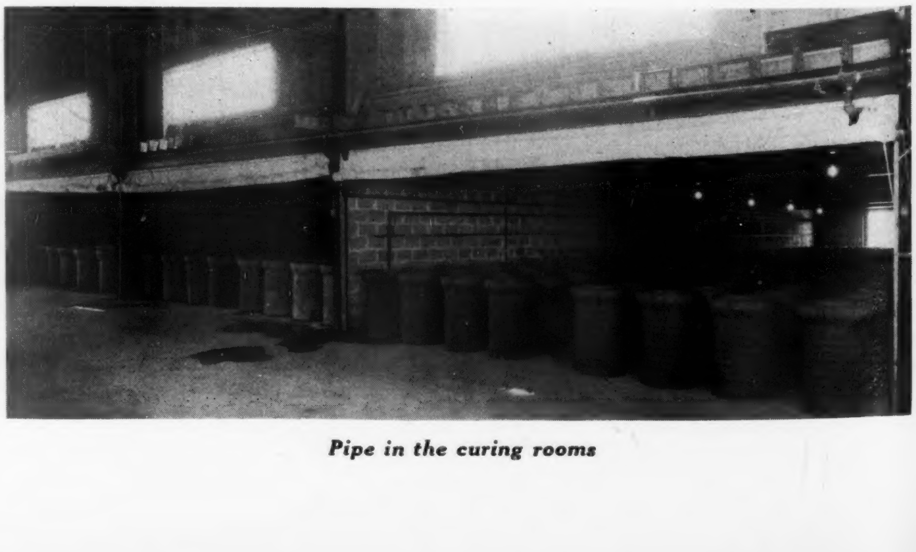
Other Products Made

Besides sewer and culvert pipe, the firm makes manhole and building block. This latter is expected to be developed into a highly profitable side line in time. Anchor machines are used in the construction of these concrete products, while a Smith special machine develops fittings and bends.

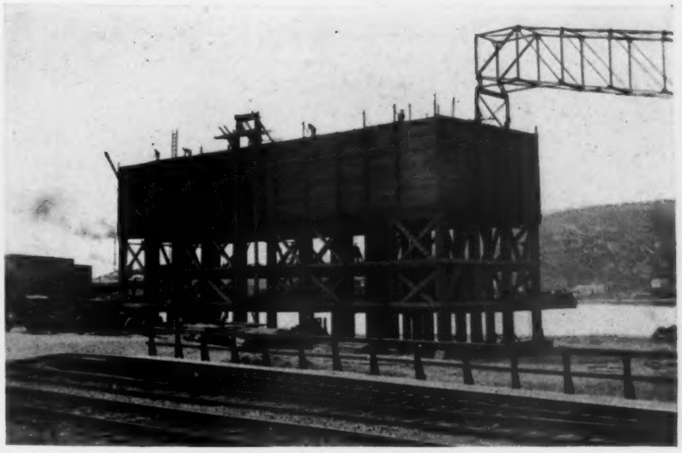
The market for concrete pipe and products is better than it ever has been. An interview with the director of public works in Kansas City developed the fact that a total of $800,000 worth of sewer work is to be done this year. One contract has been let for 4000 ft. of concrete pipe 108 in. in diameter, said to be the largest diameter pipe to be laid in the United States.

Other contracts recently let are for 2000 ft. of 96-in. pipe and another for 2000 ft. of 72-in. pipe. There is another sewer letting job in the offing amounting to $80,000 and several at $50,000.

The director stated his department had no objection to concrete pipe as it is now made; in fact, the writer gathered the impression that he favored concrete pipe for sewer work.



Pipe in the curing rooms

Hammerhead crane, steel conveyor gallery and bins at Fairview, Wash., plant of Pioneer Sand and Gravel Co.

New Ready-Mixed Concrete Plant at Seattle

THE NEW CENTRAL MIXING and distributing plant being built by the Pioneer Sand and Gravel Co., Seattle, Wash., is nearing completion and is expected to be in operation early in July. This plant, which will cost about $150,000, will be arranged so that both "Tru-Mix" concrete and dry aggregates may be delivered to trucks. It is located near the downtown section at Fairview Avenue on the southern end of Lake Union and will replace the present Westlake plant.

The aggregates will be received from the gravel pits at Steilacoom in barges which will be unloaded by a hammerhead type crane and clamshell bucket and the materials distributed to the bins by belt conveyor and tripper.

The bins, with a total storage capacity of 3000 cu. yd., are 40-ft. wide by 128-ft. long overall and are of heavy timber construction with some steel cross beams and with walls of crib construction of two by eight and two by six laid flat. They are divided into 24 compartments in two parallel rows of 12 compartments each and will be used as three units of eight bins each. Each unit will be arranged so that five gravel sizes and three sand sizes may be spouted either to a mixer or to trucks.

Headroom for Spouting

To allow headroom for spouting the different sizes to the mixers, and for dry batching, the bin bottoms are 32-ft. above the roadway, with two floors in between. The upper floor will be connected with the adjoining workhouse by a ramp and the cement will be handled in bags and transferred from warehouse to mixer hoppers by a lift type truck carrying three-wheeled buggies or hoppers. Later it is expected that bulk cement handling equipment may be installed if considered advisable.

Each batch will be weighed in a hopper arranged with a Toledo dial scale for cumulative weighing. By the re-combining of the eight different sizes of coarse and fine aggregates at the mixers it is anticipated that segregation will be practically eliminated and a perfect grading of materials obtained in each batch.

Any Size to Each Machine

At one side on the lower floor three 2-yd. Rex mixers will be installed, each arranged so that the eight different sizes of sand and gravel in one bin unit may be all spouted to its weighing hopper, and the mixed concrete discharged to trucks alongside.

The three longitudinal runways below the bins will be used for loading dry aggregates to trucks. The three mixers are expected to give a capacity of 250 cu. yd. of concrete per hour.

Thirty 2-yd. bath-tub type bodies with Wood dumping mechanism on Kenworth trucks are used for making deliveries of concrete, along with seven Paris Transit mixers.

Portland, Oregon, Proposes City-Owned Concrete Plant

THE CITY DEPARTMENT of public works of Portland, Ore., is planning a venture into the concrete business when the time and opportunity seem right, according to City Commissioner Barbur.

"Concrete work is in a state of flux at present, and we are going slow in the matter," Mr. Barbur said recently. "However, we have been negotiating for additional land on which to build a mixing plant.

"Changes in equipment are coming out every year lately," he said. "It would not do for us to make a heavy investment that would soon be obsolete.

"When the municipal paving plant started business, we knew what we could accomplish in the face of private blacktop competition. Today, competition in concrete work is severe and bids are close to blacktop all the time. We wouldn't have the velvet to work on that we had at first," Mr. Barbur explained, as another reason for being cautious.

R. S. Dulin, head of the paving plant, believed his organization could start laying concrete in a small way and build up as it had with blacktop.

"It might not be wise to start now during depressed times when there is a small volume of work to be done," he said.

"By all means, the city should extend its paving activities from blacktop to concrete. It would further keep street bids within reason, and would relieve the city from present criticism that it favors the black stuff," Commissioner Clyde said.

"We can easily have the nucleus of the fine concrete addition to the municipal paving plant, so badly needed by the city," Mr. Clyde declared.—*Portland* (Ore.) *News-Telegram.*

Japanese Cement Mills Organize Sales

AN ORGANIZATION which seeks to control the sales of cement throughout Japan is now under formation in that country, according to a report received by the Department of Commerce. The Cement Sales Association of Tokyo and similar organizations in six other Japanese towns are leading the movement.

Although the movement has been started the plan is still in its infancy. A draft plan has been prepared, however, and laid before the all Japan cement sales conference held in Nagova.

It is the plan of the sales group, the department has been informed, to model its organization after the Cement Producers Rengokai, which seeks to control the production of cement. The new organization aims to control the quantity available for market and see that the flow to market is even and regular throughout the country. At present the department is told, the distribution is disappointingly irregular and it is believed that the proposed organization will serve a long felt want.

Current Prices of Ready-Mix Concrete

AMARILLO, TEX.—Prices per cu. yd.*

Topping Mix		Terrazzo Mix	
1-1 -0	14.00	1-3 -0	9.75
1-1½-0	13.00	1-3½-0	9.25
1-2 -0	12.00	1-4 -0	8.75
1-2½-0	11.50	1-4½-0	8.50
		1-5 -0	8.25

Mortar Mix		Strength	
1-4	7.00	3000 lb. per sq. in.	9.25
1-4½	6.75	2500 lb. per sq. in.	9.00
1-5	6.50	2000 lb. per sq. in.	8.75
1-5½	6.25	1500 lb. per sq. in.	8.50
1-6	6.00		

Base

Mix		Mix	
1-1¾-3½	9.75	1-2½-5	8.75
1-2 -3½	9.50	1-2¾-5	8.50
1-2¼-4	9.25	1-3 -5	8.25
1-2½-4½	9.00	1-3 -6	8.00

*For orders of 50 cu. yd. or more, prices are 75c less per cu. yd. than quoted. Free delivery within city limits for 2 cu. yd. or more per load; $1.00 per load extra for less than 2 cu. yd. loads, except to finish a job. Additional charge of 10c per mile per cu. yd. for deliveries outside of city limits.

BELLINGHAM, WASH.—Prices per cu. yd. f.o.b. bunkers.

Mix		Mix	
1-3-5	6.12	1-2-4	6.77
1-3-4	6.40	1-2-3	7.25

Additional charges for delivery to various zones. First zone, added charge of 75c per cu. yd. to bunker prices; second zone, added charge of $1.05; and third zone, added charge of $1.40. Special rates made for carload or 50-bbl. lots.

CHAMPAIGN, ILL.—Prices per ton†

Mix		Mix	
1-2-3	5.25	1-2-4	4.75
1-3-5	4.50		

†5% cash discount.

BOSTON AND CAMBRIDGE, MASS.—Base price per cu. yd.‡

Mix		Mix	
1-2- 4 (3 to 30 cu. yd.)	10.00	1-2- 3 (30 cu. yd. and over)	8.20
1-2 -4 (30 cu. yd. and over)	7.75	1-1½-3 (3 to 30 cu. yd.)	10.55
1-3 -6 (3 to 30 cu. yd.)	9.50	1-1½-3 (30 cu. yd. and over)	8.30
1-3 -6 (30 cu. yd. and over)	7.25	1-1-2 (3 to 30 cu. yd.)	11.30
1-2½-5 (3 to 30 cu. yd.)	9.75	1-1-2 (30 cu. yd. and over)	9.05
1-2½-5 (30 cu. yd. and over)	7.50	1-2 (3 to 30 cu. yd.)	13.00
1-2 -3 (3 to 30 cu. yd.)	10.45	1-2 (30 cu. yd. and over)	10.75

‡Discount of 50c per cu. yd. allowed on deliveries made between the 1st and 15th of the month if bill is paid on or before the 25th and on deliveries made between 15th and 30th if paid on or before the 10th of following month.

CLEVELAND, OHIO—Prices per cu. yd. to contractors for orders of 2 cu. yd. or more (a); Public Square basing point.

Mix	1st mile	2nd mile	3d mile (Maximum)
1-1 -2	7.50	7.75	8.00
1-2 -3	6.30	6.55	6.80
1-2 -4	6.00	6.25	6.50
1-2½-3½	6.00	6.25	6.50
1-2½-4	5.80	6.05	6.30
1-3 -4	5.70	5.95	6.20
1-2½- 5	5.60	5.85	6.10
1-3 -5	5.50	5.75	6.00
1-3 -6	5.40	5.65	5.90
1-4 -8	5.25	5.50	5.75
1-2 Finish	7.50	7.75	8.00
1-2½ Finish	7.00	7.25	7.50
1-3 Finish	6.50	6.75	7.00

(a) Industrials or consumers 50c more than contractors. Extra charge for concrete delivered nights, Sundays or holidays, $1.00 per cu. yd. over daytime schedule. For "Velo" or "Incor" additional charge of $2.00 per cu. yd. For waterproof or plastic cements, additional charge of $1.25 per cu. yd. For orders less than 2 cu. yd. add $1.00 per yd. to above prices. Prices quoted are based upon normal discharge of load within 20 minutes after arrival of truck. A demurrage charge of $1.00 for each 15 minutes thereafter.

FAIRMONT, W. VA.—Prices per cu. yd. (c)

Mix	Quantity	Delivered	Called for
1-2-4	Less than 1 cu. yd.	11.00	10.00
1-2-4	From 1 to 4 cu. yd.	10.00	9.00
1-2-4	From 5 to 10 cu. yd.	9.50	8.50
1-2-4	From 11 to 49 cu. yd.	9.00	8.00
1-2-4	From 50 cu. yd. and up	8.50	7.50

(c) For 1-2-3 mix add 50c per cu. yd. to prices quoted; for 1-3-5 mix deduct 50c per cu. yd. from prices quoted.

HARTFORD, CONN—Prices per cu. yd. delivered

Mix		Mix	
1-2-4	(d) 7.15-7.25	1-2-0 finish	12.00
1-3-5	(d) 6.25-6.75		

(d) Placing, $1.00 per cu. yd. extra.

COLUMBUS, OHIO—Delivered prices per cu. yd.

	Zones§									
Mix	1	2	3	4	5	6	7	8	9	10
1-1½-3	7.05	7.25	7.45	7.65	7.85	8.05	8.25	8.45	8.65	8.85
1-2 -3	6.85	7.05	7.25	7.45	7.65	7.85	8.05	8.25	8.45	8.65
1-2 -3½	6.65	6.85	7.05	7.25	7.45	7.65	7.85	8.05	8.25	8.45
1-2 -4	6.45	6.65	6.85	7.05	7.25	7.45	7.65	7.85	8.05	8.25
1-2½-4	6.35	6.55	6.75	6.95	7.15	7.35	7.55	7.75	7.95	8.15
1-3 -4	6.25	6.45	6.65	6.85	7.05	7.25	7.45	7.65	7.85	8.05
1-2½-5	6.15	6.35	6.55	6.75	6.95	7.15	7.35	7.55	7.75	7.95
1-3 -5	6.05	6.25	6.45	6.65	6.85	7.05	7.25	7.45	7.65	7.85
1-3 -6	5.95	6.15	6.35	6.55	6.75	6.95	7.15	7.35	7.55	7.75
1-4 -8	5.85	6.05	6.25	6.45	6.65	6.85	7.05	7.25	7.45	7.65
1-2	9.55	9.75	9.95	10.15	10.35	10.55	10.75	10.95	11.15	11.35
1-3	7.95	8.15	8.35	8.55	8.75	8.95	9.15	9.35	9.55	9.75

§All zones radiating from center of city. Zone 1 is one mile in radius, zone 2 is two miles in radius, zone 3 is three miles in radius, etc. Discount of 25c per cu. yd. allowed for payment 10th of month following delivery date. For orders over 50 cu. yd. a deduction of 25c per cu. yd. is allowed. Orders of less than 2 cu. yd. carry same haul charge as 2 cu. yd. load. Orders for 2 cu. yd. or over delivered in full loads at 2 yd. or more. No extra charge made for finishing load if less than 2 cu. yd.

DES MOINES, IOWA—Prices per cu. yd. (b)

(Made with ¾-in. gravel for structural work)

Mix	Slump	Plant price	Zone A	B	C	D
1-2½-5	2 in.	6.50	7.00	7.25	7.50	7.75
1-2½-5	6 in.	6.75	7.25	7.50	7.75	8.00
1-2 -4	2 in.	7.00	7.50	7.75	8.00	8.25
1-2 -4	6 in.	7.25	7.75	8.00	8.25	8.50
1-2 -3½	2 in.	7.50	8.00	8.25	8.50	8.75
1-2 -3½	6 in.	7.75	8.25	8.50	8.75	9.00
1-2½-3	2 in.	8.00	8.50	8.75	9.00	9.25
1-2½-3	6 in.	8.25	8.75	9.00	9.25	9.50

(Made with pea gravel for cellar and sidewalks)

Mix	Slump	Plant price	Zone A	B	C	D
1-2½-5	2 in.	6.25	6.75	7.00	7.25	7.50
1-2½-5	6 in.	6.50	7.00	7.25	7.50	7.75
1-2 -4	2 in.	6.75	7.25	7.50	7.75	8.00
1-2 -4	6 in.	7.00	7.50	7.75	8.00	8.25
1-2 -3½	2 in.	7.25	7.75	8.00	8.25	8.50
1-2 -3½	6 in.	7.50	8.00	8.25	8.50	8.75
1-2½-3	2 in.	7.75	8.25	8.50	8.75	9.00
1-2½-3	6 in.	8.00	8.50	8.75	9.00	9.25

(b) Discount of 50c per cu. yd. allowed on deliveries made between the 1st and 15th of the month if bill is paid before the 25th and on deliveries made between 16th and 30th if paid before the 10th of following month. Quick setting $2.00 per cu. yd. extra; waterproofing, $2.00 per cu. yd. extra. Each zone approximately one mile.

INDIANAPOLIS, IND.—Prices per cu. yd. in small quantities, for del'y. within 3 mile haul.

Mix	
1 bbl. cement/cu. yd. concrete	5.50
1¼ bbl. cement/cu. yd. concrete	6.00
1½ bbl. cement/cu. yd. concrete	6.50

LOS ANGELES, CALIF.¶—Prices per cu. yd.

Mix	1 to 5 yd.	5 to 25 yd.	25 or more
3-50-50	8.25	7.25	6.25
4-50-50	8.85	7.85	6.85
1-3 -6	8.95	7.95	6.95
1-3 -5	8.95	7.95	6.95
1-2½-5	9.50	8.50	7.50
1-3 -4	9.75	8.75	7.75
1-2¾-3½	10.00	9.00	8.00
1-2 -4	9.85	8.85	7.85
1-2½-3½	10.10	9.10	8.10
1-2½-3¼	10.05	9.05	8.05
1-2 -3	10.60	9.60	8.60
1-2 -3½	10.20	9.20	8.20

¶Above prices for deliveries in Zone 1 (1-5 miles). Added charge of 75c per cu. yd. for deliveries in Zone 2 (5 to 10 miles). Added charge of $1.50 for Zone 3 (10 to 15 miles). Discount of 50c per cu. yd. if payment is made within 10 days from delivery.

MILWAUKEE, WIS.—Prices per cu. yd. (e)

28-day breaking strength:	Per sq. in.	Slump 2 to 4 in.	4 to 6 in.	6 to 8 in.
Garage footings and walls	2000 lb.	7.00	7.40	7.80
Footings, floors, walls	3000 lb.	7.50	7.90	8.30
City paving	3300 lb.	7.75	8.00	8.40
Sidewalks, curbs	4000 lb.	8.25	8.75	9.25
24-hour high early strength	5000 lb.	10.00	10.50	11.00

Sold on old mixture method, 2- to 4-in. slump; 4- to 6-in. slump; 6- to 8-in. slump.

	Mix	
Walls—Garage footing	1-3-5	7.00
City paving	1-2-4	7.50
Garage floors, walls	1-3-3	7.50
Sidewalk	1-2-3	8.00
Special strength (machine bases)	1-1½-2¼	9.50
Facing	1-3	10.50
Facing	1-2	12.00

(e) Discount of 25c per cu. yd. if paid by 10th of following month.

MEMPHIS, TENN.—Prices per cu. yd. delivered in city.†

Strength	With gravel aggregate	With stone aggregate	Strength	With gravel aggregate	With stone aggregate
4000 lb.	11.00	11.18	2000 lb.	8.00	8.40
3500 lb.	9.50	9.84	1800 lb.	7.30	8.25
2800 lb.	8.70	9.35	1600 lb.	7.10	8.05
2400 lb.	8.40	8.78			

†For del'y. outside city, price is 30c cu. yd. over above prices for each mile.

MONTGOMERY, ALA.—Prices per cu. yd. delivered in city limits. (g)

Mix		Mix	
1-2 -4	6.25	1-3-6	5.60
1-2½-5	5.85	1-2 mortar topping	11.00

(g) Discount of 25c per cu. yd. for payment in 30 days. Special quotations for quantity orders.

MORGANTOWN, W. VA.—Prices for jobs of 1 to 10 cu. yd., delivered.(f)

Mix		Mix	
1-2-3	9.50	1-2½-4	8.90
1-2-4	9.00	1-2½-5	8.50

(f) Prices subject to cash discount of 25c per cu. yd. for payment 15 days from date of invoice.

NEW ORLEANS, LA.—Plant prices per cu. yd. for 30 yd. or less. (h)

Mix	Cement Portland	Cement "Incor"	Mix	Cement Portland	Cement "Incor"
1-4 -8	6.10	7.25	1-2 -2	8.65	11.80
1-3 -6	6.70	8.25	2-3 -6	9.10	12.20
1-3 -5	6.90	8.65	2-3 -3	9.85	13.75
1-2½-5	7.20	9.15	1-1½ topping	11.70	17.80
1-2½-4	7.35	9.50	1-2 topping	10.05	14.95
1-2 -4	7.70	10.05	1-3 topping	8.55	12.25
1-2 -3	8.15	10.85			

(h) Various charges, in excess of plant prices, are made for delivery based on zones; 5% discount for payment 15 days from date of invoice.

NEWARK AND HARRISON, N. J.§

1-2 -4	9.50	1-3 -6	8.50
1-3 -5	9.00	1-2½-5	9.25

§Discount of 2% if paid by 10th of month following delivery.

PITTSBURGH, PENN.—Range of prices, according to zone, for ready-mixed concrete. Prices per cu. yd. delivered, up to 200 cu. yd. (j)

Mix	Strength	
1-1½-2½	4000 lb.	9.05–10.05
1-2 -3	3500 lb.+	8.65– 9.65
Class A	3500 lb.	8.45– 9.55
1-2½-3½	3000 lb.+	8.35– 9.45
1-2 -4 Class B	3000 lb.	8.25– 9.35
1-2½-4½	2500 lb.+	8.05– 9.15
1-2½-5	2500 lb.	7.90– 9.00
1-3 -5	2000 lb.	7.80– 8.90
1-3-6	1500 lb.	7.65– 8.75

Prices per cu. yd. delivered, over 200 cu. yd. (j)

Mix	Strength	
1-1½-2½	4000 lb.	8.05– 9.80
1-2 -3	3500 lb.+	7.65– 9.40
Class A	3500 lb.	7.45– 9.20
1-2½-3½	3000 lb.+	7.35– 9.10
1-2-4 Class B	3000 lb.	7.25– 9.00
1-2½-4½	2500 lb.+	7.05– 8.80
1-2½-5	2500 lb.	6.90– 8.65
1-3 -5	2000 lb.	6.80– 8.55
1-3 -6	1500 lb.	6.65– 8.40

(j) Class A concrete is a special concrete prepared for the city of Pittsburgh. Plus indicates the strength shown is the minimum strength. Dealer's commission of 50c per cu. yd. allowed in all zones with exception of Yellow Zone. No commission allowed over 200 cu. yd. Prices subject to cash discount of 25c per cu. yd. for payment 15 days from date of invoice.

PUEBLO, COLO.—Prices per cu. yd.‖

Strength	Zone 1	Zone 2	Zone 3
3000 lb.	8.00	8.40	8.80
2700 lb.	7.75	8.15	8.55
2400 lb.	7.50	7.90	8.30
2100 lb.	7.10	7.50	7.90
1500 lb.	6.50	6.90	7.30
1200 lb.	6.50	6.90	7.30

‖On larger quantities to contractors, deduct 50c per cu. yd.

ROCHESTER, N. Y.—Prices per cu. yd.

Mix	Plant price	Prices for delivery to various zones: Zone 1	2	3	4	5	6	7
1-2 -3	7.00	7.75	7.90	8.05	8.20	8.35	8.50	8.65
1-2½-3½	6.55	7.30	7.45	7.60	7.75	7.90	8.05	8.20
1-3 -4½	6.20	6.95	7.10	7.25	7.40	7.55	7.70	7.85
1-4 -5	6.00	6.75	6.90	7.05	7.20	7.35	7.50	7.65
1-5 -6	5.65	6.40	6.55	6.70	6.85	7.00	7.15	7.30

SAN ANTONIO, TEX.—Prices per cu. yd. on city deliveries.‡

Mix		Mix	
1-3-5	7.50	1-2-4	8.00

‡Deduction of 50c per cu. yd. on large orders for delivery within one mile of plant.

SAN JOSE, CALIF.—Prices per cu. yd. delivered within one mile of plant. (k)

Mix	Up to 5 cu.yd.	Over 5 cu.yd.	Mix	Up to 5 cu.yd.	Over 5 cu.yd.
1-6	9.00	8.50	1- 9	8.00	7.50
1-7	8.50	8.00	1-12	7.00	6.50

(k) For deliveries outside of this area add 30c per cu. yd. per mile. Cash discount of 50c per cu. yd. if paid in full by 10th day of following month.

SANTA CRUZ, CALIF.—Price per cu. yd. delivered within two-mile radius of plant. (l)

Mix	Over 5 cu.yd.	Less than 5 cu.yd.	Mix	Over 5 cu.yd.	Less than 5 cu.yd.
1-6	9.00	9.50	1-8	8.10	8.60
1-7	8.50	9.00	1-9	7.90	8.40

(l) For deliveries outside of this area add 30c per cu. yd. per mile. Cash discount of 50c per cu. yd. if paid in full by 10th day of following month.

SPRINGFIELD, ILL.—Prices per cu. yd.

Mix		Mix	
1-3 -6	9.20	1-2 -3½	10.30
1-3 -5	9.40	1-2 -3	10.50
1-2½-4	9.70	1-1½-3	10.70
1-2 -4	10.00	1-1 -2	12.50

ST. PAUL, MINN.—Prices per cu. yd. delivered within three miles of plant. (m)

1-2-4 mix	6.75	1-3-5 mix	6.30

(m) For greater distances of haul, increase of 10c per cu. yd. per mile.

WATSONVILLE, CALIF.—Prices per cu. yd.‖

Mix		Mix	
1-6	9.90	1- 9	8.50
1-7	9.30	1-12	7.75
1-8	9.00		

‖Prices are for delivery anywhere within city limits, and are subject to cash discount of 50c per cu. yd. for payment in full on or before the 10th day of following month.

WILKES-BARRE, PENN.—Prices per cu. yd. delivered within one mile of plant, subject to discount of 25c per cu. yd. for payment within 10 days from date of delivery. Extra charge of 15c per cu. yd. for each additional mile.

Mix	Gravel	Stone	Mix	Gravel	Stone
1-2 -3	7.60	7.90	1-3-5	6.75	7.05
1-2 -4	7.30	7.60	1-3-6	6.75	7.05
1-2½-5	7.00	7.30			

Economics of Crushed Stone Production

A RECENT PUBLICATION by the Bureau of Mines, United States Department of Commerce, "Economics of Crushed Stone Production," contains an excellent summary and offers a particularly interesting contribution to the industry in the section on capital requirements. There is a fairly complete bibliography included.

The two accompanying tables are of particular interest and show capital investment per annual ton of production at crushed-stone plants and capital investment as divided between land and equipment.

The figures are based on actual production and not plant capacity.

[1] Production under 100,000 tons per year.
[2] Production 100,000 to 250,000 tons per year.
[3] Production 250,000 to 500,000 tons per year.
[4] Production 500,000 to 1,000,000 tons per year.
[5] Production over 1,000,000 tons per year.

CAPITAL INVESTMENT PER ANNUAL TON OF PRODUCTION AT CRUSHED-STONE PLANTS

	Investment per ton
Average of 16 limestone plants each producing less than 100,000 tons per year	$2.12
Average of 10 limestone plants each producing between 100,000 and 250,000 tons per year	1.28
Average of 9 limestone plants each producing between 250,000 and 500,000 tons per year	1.48
Average of 5 limestone plants each producing between 500,000 and 1,000,000 tons per year	1.21
Average of 8 limestone plants each producing over 1,000,000 tons per year	1.14
Average of 4 granite plants	1.20
Average of 12 trap-rock plants	1.68
Average of all the above plants	1.25

CAPITAL INVESTMENT AS DIVIDED BETWEEN LAND AND EQUIPMENT

Material	Number of quarries	Land and mineral	Plant and equipment	Total	Pct. land and mineral to total
Limestone[1]	12	$0.59	$1.53	$2.12	28.04
Do[2]	7	.19	1.09	1.28	14.47
Do.[3]	9	.13	1.35	1.48	8.61
Do.[4]	5	.21	1.00	1.21	17.38
Do.[5]	8	.18	.96	1.14	15.50
Granite	3	.11	1.09	1.20	9.54
Trap rock	10	.22	1.46	1.68	12.91
All quarries	54	.19	1.06	1.25	14.92

Hearings on Cement Tariff

REQUESTS by domestic producers for a substantial increase in the present tariff duty of 6 c. per 100 lb. on cement, and by importers for a reduction of the present tariff, were presented to the United States Tariff Commission at a hearing held here June 10 and 11. The hearing was a result of a resolution passed by the Senate June 18, 1930, requesting the commission to investigate production costs here and abroad with a view to recommending what, if any, changes need be made in the present duty.

Albert Mac C. Barnes, of New York, representing domestic manufacturers, asked the commission to recommend an increase to 36 c. a bbl. The present duty amounts to 23 c. a bbl. Under the tariff act of 1930 the President is empowered to raise or lower present duties by not more than 50%, after the Tariff Commission has recommended the increase or decrease.

Testimony of the importers and foreign producers was heard first by the commission, witnesses on this side being Emmett J. McCormack, vice-president of Moore & McCormack, Inc.; L. P. E. Giffroy, New Orleans, sales representative in the United States of Cimentories Brigueteriel Riunis, a Belgian co-operative exporting organization; W. T. Miller, Boston, of Jenney & Lux, Inc., importers; E. R. Hollander, New York, of the Ferrocrete Import Co., Inc., and W. M. Richardson, Philadelphia, president, Philadelphia Export Co.

Mr. McCormack said retaliatory tactics of foreign countries in raising tariff barriers against American-made goods, was seriously affecting the profitable operation of his steamship line. He urged a reduction of the present tariff.

Mr. Giffroy said the "C. B. R." was not a cartel, but merely an association of plants for a pooling of expenses and profits. He said imports of cement constituted only a trifling amount of the total consumption in the United States and pointed out that foreign cement could not be sold in the interior of this country, because of the rail freight rates.

Even during 1925 and 1926 when the Florida boom, accompanied by a railroad embargo on shipments of cement and other commodities destined to Florida points, imports of cement amounted only to 2% of domestic consumption. The Florida boom, he said, was responsible for the greatest sale of Belgian cement ever made in the United States.

Mr. Giffoy said imports of cement into the United States had declined 40% between 1929 and 1930. This decline, he said, was attributable to the Hawley-Smoot tariff.

Commissioner John Lee Coulter reminded Mr. Giffroy that there had been a steady decline in cement imports since 1925—long before the Hawley-Smoot act was thought of. Neither Mr. Giffroy nor other witnesses to whom Mr. Coulter put the question could explain the reason for the decline prior to passage of the 1930 act.

Mr. Giffroy said the capitalization cost per barrel of cement in Belgium was $1.70, while in the larger United States mills it ranges from $2.10 to $2.50. He said capitalization cost was obtained by dividing the capitalization of the mills by their productive capacity.

The imputed interest charges per barrel of Belgian cement amounted to about 6 to 9 c., he said, while those in the United States range from 19 to 20 c. The difference, he said, was the result of lower capitalization of Belgian mills, induced largely by a tax on capitalization in that country.

This statement later led Mr. Richardson to say that "a little judicious squeezing of water" from the capitalization of some of the American mills might help greatly in reducing domestic costs of production. Mr. Richardson also said the present tariff was ruining importers.

Mr. Miller testified as to the disadvantages faced by importers in marketing foreign-made cement. He said it was necessary to import in large quantities, so a supply always would be on hand to meet requirements of contractors. This meant that orders must be placed six or seven weeks ahead of time, he said. In addition, he said, importers must handle bag cement, while domestic concerns had started to handle the bulk product.

Witnesses for the domestic manufacturers included Anthony Joureguy, an accountant, who testified as to domestic costs; F. N. Coogan, vice-president, Alpha Portland Cement Co.; James H. Ackerman, vice-president, Lawrence Portland Cement Co.; Charles F. Conn, vice-president, Giant Portland Cement Co.; James C. Bradshaw, president, James C. Goff Co., Providence, R. I., a building material firm; John C. Bowen, vice-president, Lehigh Portland Cement Co.; J. W. Johnston, vice-president, Lone Star Cement Co. of Alabama; L. R. Ferguson, vice-president, Lone Star Cement Co. of Texas; T. K. Partridge, vice-president, Southwestern Portland Cement Co., and M. A. Koffman, secretary of the Southwestern Portland Cement Co.

Witnesses for the domestic manufacturers said foreign producers also had played havoc with the American export trade in cement. They also told of efforts by domestic manufacturers to meet foreign competition by resorting to differential rates and price reductions.

One of the harmful effects of these practies, it was said, was that buyers were charging sectional favoritism in the price policies of the cement manufacturers, because of the adoption of the "scale-back" method, which lowered rates over areas backward toward the "safe" inland territory.

Mr. Ackerman said his company had made concessions to Boston dealers of 45 c. per bbl. to meet foreign competition, but was forced to withdraw from active solicitation in that territory. Belgian competition had forced his company's Thomaston, Me., plant to reduce production by half in 1928, he said.

Kemper Simpson, representing foreign producers and importers, presented literature of the Lawrence Portland Cement Co. showing that sales increased substantially from 1928 to 1929. Mr. Barnes admitted the company showed a profit of $728,000 in 1928, but said this represented only 7% on the capital investment of the company.

Lower prices of foreign cement had caused the loss of many building contracts by American cement producers, Mr. Bradshaw said.

Charles F. Conn, president, Giant Portland Cement Co., Philadelphia, Penn., testified that the Portland Cement Association has spent $35,000,000 in promoting the use of cement. He said the association does not advertise against the use of foreign cement.

James C. Bradshaw, representing James C. Goff Co., building material dealers, Providence, R. I., testified that numerous building contracts were lost by American cement because of the lowered price of the imported product.

John C. Bowen, vice-president, Lehigh Portland Cement Co., New York, said his company had to reduce prices in the entire territory around Boston and Providence because of foreign pressure. The Porto Rican market has been lost because of inability to meet foreign competition, he said.

Testimony that foreign cement has disturbed the competitive situation in the Gulf States was presented by J. W. Johnston, vice-president, Lone Star Cement Co. of Alabama, and L. R. Ferguson, vice-president, Lone Star Cement Co. of Texas.

T. K. Partridge of the Southwestern Portland Cement Co., Los Angeles, Calif., asserted that in his area also the effect of foreign competition has been felt. He said that Belgian clinker had been imported and ground and sold at a lower price than domestic cement.

Dr. Simpson brought out through examination of Mr. Partridge that the agreement whereby the Southwestern company arranged to supply the Blue Diamond Co. with domestic clinker was to eliminate foreign competition and discourage any potential clinker grinding mills.

The cost of clinker represents 85% of the finished cement, M. A. Koffman, also of the Southwestern company, testified.

In closing his case for the domestic manufacturers, Mr. Barnes declared that the industry believes that the duty of 23 c. per bbl. imposed by the 1930 Tariff Act is "totally inadequate" and asked that the rate be in-

creased to 36 c. per bbl. The industry does not complain of the volume of imports, he said, but does not believe it is a healthy condition wherein such imports so materially affect the domestic price situation. The testimony presented before the Commission, he stated, shows the weighted average cost of domestic cement delivered at the principal markets to be $1.98 while that of imported cement is $1.47.

Summing up his case for the importers, Dr. Simpson asserted that the very fact that imports have been so low for so many years, despite the absence of any duty, indicates that costs in the United States cannot be much higher than abroad. He asked that the cost-difference principle be applied in determining rates and that the present duties be eliminated or reduced.

The producers were given 30 days in which to file briefs.

New York State Crushed Stone Men Discuss Co-operaton with Other Groups

THE MAY MEETING of the New York State Crushed Stone Association was held at the Yahnundasis Golf Club at Utica on Friday, May 22. Secretary Geo. E. Schaefer advised of the personnel of the committee named by President A. S. Owens to work in conjunction with a similar committee from the Empire State Sand and Gravel Association on all matters of common interest. This committee appointed after the Syracuse meeting is composed of Secretary Schaefer, B. R. Babcock, of Albany, and A. B. Caldwell, of Stafford. A communication received from Secretary Kelly of the Sand and Gravel Association was read to the meeting, stating that its committee would probably be named at a meeting in Albany on May 27.

The meeting again discussed the subject of uniform sales contracts for all member organizations, and it developed that the majority were in favor of using the form. A. G. Seitz offered the resolution supported by Mr. Babcock that the secretary be instructed to procure 3000 copies and to pro rate them among the member companies in accordance with their normal tonnage.

The interpretation committee, headed by F. C. Owens, made a brief report with information that not much had been done because of the fact that shipments to construction projects had only started during the preceding week, and but little information was at hand. It was decided that members report to Chairman Owens when or if difficulties were encountered.

A communication from Secretary Hayes of the State Contractors' Association regarding the advisability of forming a council of groups identified with the construction industry, was read to the meeting. Mr. Hayes advised in his letter that problems frequently arise which relate both to the industry and to the particular group, and that periodic discussion of these problems by such a council would be helpful to all. It was the concensus of opinion of the meeting to accept Mr. Hayes' suggestions, and after some discussion John Rice, Jr., offered a motion seconded by Mr. Seitz that the chair appoint a committee to represent the crushed stone industry on the proposed council. President Owens appointed the committee, which is to act with the Sand and Gravel Association: Messrs. Schaefer, Babcock and Caldwell.

A very interesting and important discussion then developed regarding the apparent non-uniformity of conditions throughout the state. It was brought out that the interpretation of sizes of stone was different in some districts than in others, depending in many instances upon the individual opinion of the engineer in charge. It was also developed that different sizes of stone were used in different localities for the same type of work with retread mentioned as a specific example. It also developed that the 30-day credit basis of freight charges as agreed upon between the highway department and the interested carriers was used only in certain districts, while in others the shipper actually prepaid freight and billed on a delivered basis. These, and other practices suggested the thought that it would be to the advantage of both purchaser and shipper to have uniform standard methods of procedure.

Southern Building Supply Dealers Friends Again with Aid of Walter Jahncke

A SPECIAL BULLETIN of the Southern Builders Supply Association describes a recent meeting, which will prove interesting to many rock products producers in the South, and particularly so to the many friends in the industry of Walter F. Jahncke. The bulletin reads in part:

"For the first time in over a year the outstanding men in the building material field of the South mingled again in close communion and good fellowship. These men who were the very life and back-bone of the old Southern Builders' Supply Association for so many years greeted each other as only warm-hearted, congenial friends can.

"A two-day session with business and pleasure combined was held May 30-31, at Waldheim, the country estate of Walter F. Jahncke, on the picturesque Tchefuncta, where three rivers converge and where Southern hospitality reigns supreme.

"With Miss Ruth Jahncke as hostess, it follows that nothing was left undone for the comfort and pleasure of the guests who boarded the well appointed, comfortable and commodious yacht 'Porte Bonheur' of the host, Walter F. Jahncke, who welcomed the 'old guard' with his customary cordiality.

"The following were present: John D. Baker, Jacksonville, Fla.; R. D. Conger, Jackson, Tenn.; W. W. Fischer, Memphis, Tenn.; R. N. Hawkins, Birmingham, Ala.; R. D. Herbert, Nashville, Tenn.; Robert Hibbler, Chattanooga, Tenn.; Frank D. Horton, Birmingham, Ala.; Walter F. Jahncke, New Orleans, La.; W. W. Milling, Mobile, Ala.; John G. Pope, Chattanooga, Tenn.; Murrell D. Ross, Macon, Ga.; Ed. S. Spencer, Jacksonville, Fla.; John J. Voelkel, Sr., New Orleans, La.; John J. Voelkel, Jr., New Orleans, La.; Judge Edgar Watkins, Atlanta, Ga.

"The trip across Lake Pontchartrain, and up the beautiful Tchefuncta river was very enjoyable. Lunch and refreshments were served on the yacht, and after the party arrived at Waldheim a hearty dinner was served, after which, a business meeting was held. Then came a moonlight bathing revue in the swimming pool nearby.

"The second day being Sunday, a number of the guests attended church. Some went fishing, some played miniature golf and others enjoyed various games and inspection trips of the surrounding country, which is beautiful at this season of the year.

"The business session was continued on the spacious grounds under fine shade trees, where reorganization plans were concluded, and the same officers as were elected in Chicago at the National Convention last December were re-elected, to serve until January, 1932: Walter F. Jahncke, president; W. W. Fischer, vice-president; John J. Voelkel, Sr., treasurer.

"Walter F. Jahncke, who has always stood out as one of the leaders of association work, was given authority to immediately reorganize the various groups into an active whole, that would function for the benefit of the entire industry of the South.

"Those present pledged their hearty co-operation, financial and moral support, and it was decided that the membership would permit all building material merchants in the several Southern states to join the Association upon the payment of membership dues.

"Manufacturers operating in the Southern states will be permitted to join as associate members.

"Headquarters of the Southern Association will be located in New Orleans, with general offices at 814 Howard Avenue."

Asbestos Milling in Rhodesia

SERPENTINIZATION and the formation of chrysotile asbestos in the Great Dyke of Rhodesia are probably due to surface waters, says F. E. Keep in a recent article. The zones are localized in zones of weakness. Of rock passing the grizzly at the mill head, 8 to 12% passes to the cleaning mill as fiber and grit.—*Chemical Abstracts.*

Canadian Investigations of Rock Products

THE ANNUAL REPORT for 1929 of the Department of Mines, Canada, Ore Dressing and Metallurgy Division, includes four tests on nonmetallic minerals of interest to the rock products industry.

Tests were made to determine the quantity and quality of fibre that could be recovered from the asbestos-bearing rock of Temiscamingue county, Quebec. The rock proved to have a large quantity of very poor quality fibre.

Tests were made on sands from Guigues township, Quebec. The sands represented by two samples were found to be much cleaner and whiter than two others, the last two being light brown in color. The first two sands could be cleaned up and used for making glass. All of the samples submitted were suitable for such use as steel foundry sand, core sand, etc.

Samples of mica from St. Pierre de Wakefield, Quebec, were tested. This mica is an amber variety and unsuited for making wallpaper, so wet grinding is unnecessary. Since dry grinding is cheaper it was recommended the following processes be used in its preparation; hammer mill for preliminary crushing, and hammer mills, large KEK machines or similar grinders operating in conjunction with rotary screens for finer grinding.

Gypsum from Amherst, Grindstone and Alright, islands of the Magdalen group, Quebec, proved suitable for the manufacture of structural materials having a gypsum base. The Amherst and Grindstone deposits would not be satisfactory where a finishing plaster is required as they do not make white plasters.

Development of Russian Fertilizer Industry

THE WORK of the Scientific Institute on Fertilizers of the Soviet consists of studying (1) raw materials necessary, (2) methods of treating these materials for the manufacture of fertilizers and (3) methods of applying the fertilizers in the various conditions peculiar to the U. S. S. R. The Institute has been in operation since 1919.

This work has called for the investigation of phosphate rock and apatite, which exists in exportable quantities. Known deposits of phosphate rock in Russia amounts to 808,563,000 tons.

The five-year plan includes: the expansion of exploration of resources to include limestone, gypsum, barite, phosphoric iron ores and potassium, in addition to phosphate and apatite rock; building a series of fertilizer factories with a capacity of 200,000,000 tons each per year; development of methods of producing a series of concentrated organic and combined fertilizers; study and investigation of the economical use of fertilizers.

Production of Potash in 1930

POTASH PRODUCED in the United States in 1930 amounted to 105,810 short tons of potassium salts equivalent to 61,270 short tons of potash (K_2O), according to the United States Bureau of Mines, Department of Commerce. Sales by producers amounted to 98,280 tons. The potash materials of domestic origin, sold by producers in 1930, were valued at $2,986,157 f. o. b. plants. About 20,550 tons of potassium salts remained in producers' stocks December 31, 1930. The sales of salts decreased 3% with a decrease of 1.6% in K_2O content. The total value of the sales decreased less than 1%. More crude salts remained in the hands of producers at the end of 1930 than at the end of 1929. The production was chiefly from natural brines in California and distillery residue from molasses in Maryland. Alunite was shipped from Sulphur, Nevada, to California, ground and sold as fertilizer, and a small amount was also produced at Marysvale, Utah, for use in experimental work. Cotton boll ash was also sold as a fertilizer based on its content of water soluble K_2O.

The potassium salts imported for consumption into the United States in 1930, according to the Bureau of Foreign and Domestic Commerce, amounted to 978,974 short tons. The estimated K_2O equivalent of these imports is 342,071 short tons. This represents an increase of 5% in gross weight over the imports for 1929. The total value of the imports was 3% more than 1929. The potassium salts imported chiefly for fertilizer showed an increase of 7% in quantity and 13% in value.

The potassium salts imported for the chemical industry decreased 23% in quantity, and 24% in value.

The exports of potassium salts show a decrease from 1929 of 17.5% in quantity and 14.5% in value for potassium salts (not fertilizer) and an increase of 10% in both quantity and value of potash fertilizer material shipped.

Working Semi-Precious Stones

IN A VERY CLEAR and easily readable manner J. H. Howard, an amateur lapidary who knows how, tells how to saw, grind and polish precious and semi-precious stones. The necessary equipment, its cost and where to get it is given. Then Mr. Howard describes what to do and how. He also tells you many things you shouldn't do. In order to be sure his story is clear the book is illustrated and illustrations of different operations are shown.

However, reading the book is the simplest part in learning the profession. The two prime requisites, after knowing the processes, are practice and patience. One who is interested in this hobby will find the book, "The Working of Semi-Precious Stones" of considerable interest and value.

California Nonmetallic Minerals Increasing in Importance

THE QUARTERLY REPORT of the division of mines of the state of California has recently been issued. This report covers the quarter ending October, 1930.

The biennial report of the state mineralogist is included in this report. In this report Mr. Bardley, state mineralogist, says, "during the calendar year 1928, there was reported commercial production of 54 different mineral substances having a total value in crude state of $332,714,233. In 1929 the value increased to a total of $432,248,228 for a like number of substances. The increase is principally creditable to petroleum, but advances were also made by diatomaceous earth, granite, quicksilver, salt, soda, and others. There were a few decreases, notably cement, borax, and others." Extracts from the report are:

"The outstanding event during the period under review was the establishing of the geological branch for the beginning of a comprehensive geological and economic mineral survey. The work of this branch is being based on an anticipated 10-year program.

"The most important advances economically in recent years in California and on the Pacific coast are being made in the utilization of the nonmetallic minerals. There is at present urgent demand for accurate, authoritative, and up-to-date information on these minerals, their location, character, extent, availability, and transportation facilities. Our program for the coming biennium must include the continuance of the statewide survey of these nonmetallic resources."

In the report of the Sacramento field division a summary of the operations in Butte county of the Bechtel-Kaiser Rock Co., Coast Rock and Gravel Co., and the Johnston Rock Co. are given. The layout of a new plant now being built by the Johnston Rock Co. is shown.

The report of the San Francisco district contains a report of the several magnesite operations in Tulare county, one of the important producing districts of the country. A survey of the limestone deposits and operations in the same county are also of interest. In addition, under the head of the stone industry, a summary of concrete products operations, crushed rock and sand and gravel operations is given.

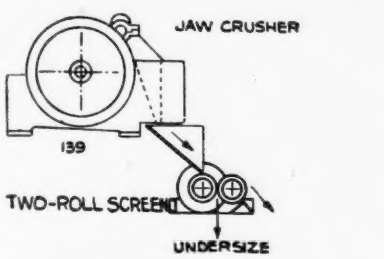
Heat- and Sound-Insulating Material

THE RESIDUE of the combustion of rice chaff is used (suitably in the proportion of 50% or more) with other materials such as asbestos, "silicate wool" and a small proportion of binding substances such as starch or fused silicates, or with clay and granulated cork, etc., in British patent No. 336,440, to form an insulating material.

New Machinery and Equipment

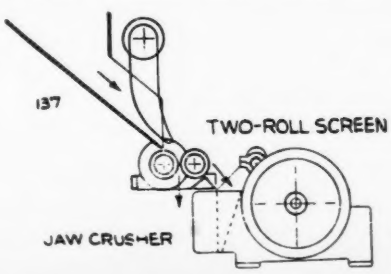
Roller Bar Screen Announced

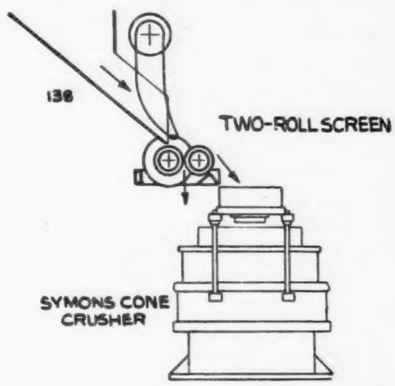
A ROLLER BAR SCREEN that operates in a new way is announced by the Ross Screen and Feeder Co., New York, N. Y. It is claimed this screen is immune



from blocking, jamming, and jarring with any material and in whatever form it comes in. It is also claimed to be free of any crushing action. The aperture size is said to be adjustable for a wide range of sizes while in operation as well as when shut down.

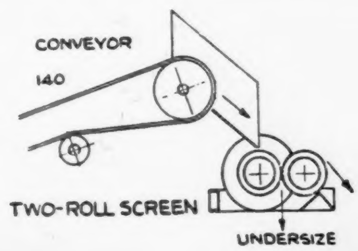
The screen elements consist of alternate free and driven rolls having smooth and serrated corrugations respectively. The screens consist of 2, 4, 6 or more rolls for duties ranging from heavy scalping to fairly small sizing work. In its operation the "fines" material flows down in the smooth corrugations of the idle roll and passes through the apertures, practically untouched by the serrated roll. The oversize pieces are instantly ejected upon contact with the serrated surface of the driven roll which, the manufacturer states, at the same time imparts to the pieces a positive, cleansing vibration. The screen is said to be not only "live-roll" but "live-aperture." Two of

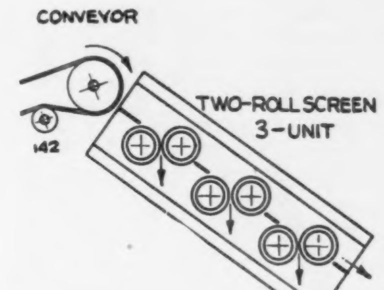




these "live-aperture" rolls are said to do the work formerly requiring six of the old type "live-rolls."

The Ross two-roll vibrating screen is built in standard sizes with rolls from 3- to 33-in. diameter and apertures from ½- to

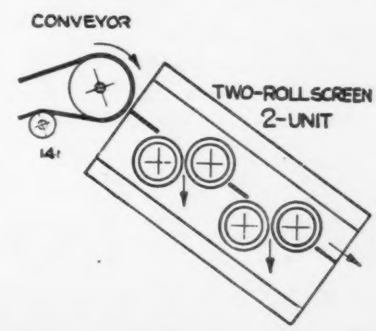


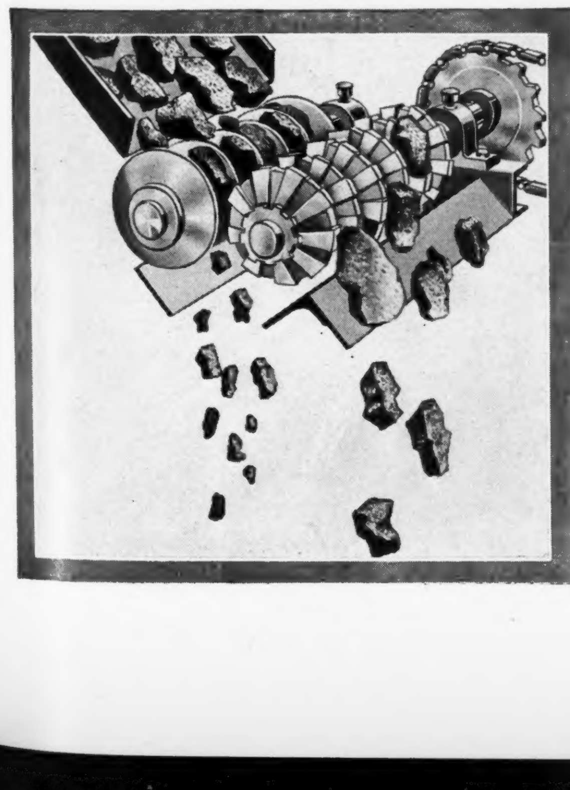


9½-in. Larger sizes are built to requirements, and the makers say with the new screen it is possible to do mechanically the heavy work hitherto done only by grids and bar grizzlies plus manual labor.

The manufacturer also says sticky materials respond readily to the breaking up and agitating action of the Ross two-roll screen. A special unit has been designed for placing over the head end of existing meshcloth vibrating screens to break up sticky material.

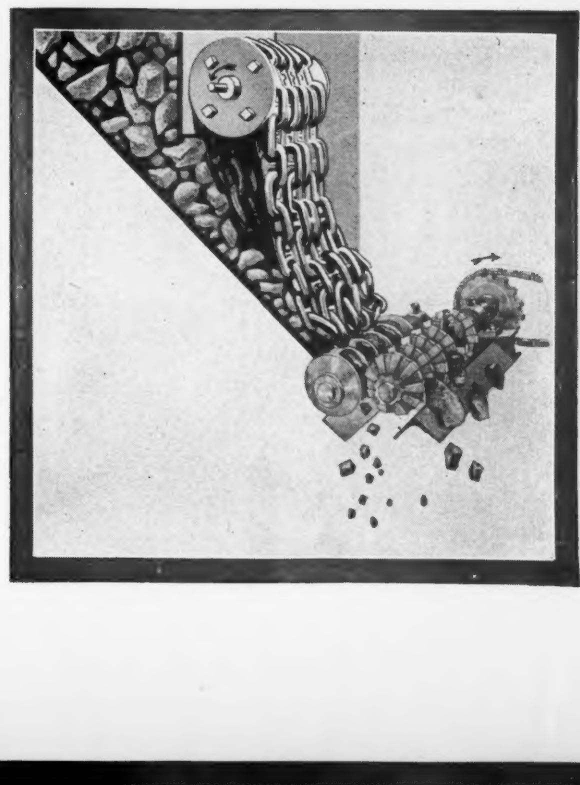
The maker also states that the new screen in its multiple form lends itself well to washing operations.





Screen elements consist of alternate rolls having smooth corrugations

Feeder device is shown at right



New Hook-On Bucket

THE ERIE STEEL Construction Co., Erie, Penn., announces the manufacture of a "hook-on" or "single-line" type of clamshell bucket.

Ready to use by placing bucket yoke on crane hook

The new bucket is said to have extra closing power. This bucket is instantly available for work on cranes by placing the bucket yoke on the crane hook.

Operation of the bucket is carried on from the crane cab, it is claimed. The closing line is reeved around snubber sheaves, to eliminate serious opening shock, and when the bucket is fully open the power arm comes to rest against heavy bumper springs which act in combination with the rope reeving to give a smooth opening bucket. Moving parts are bronze bushed and lubricated by the Alemite system.

Test Water Cooling Coils

SAMPLING of steam and water at various points in the power cycle are taken: (1) to determine quality of water supply; (2) to control the method of treatment for the prevention of corrosion and scale prevention; (3) to control boiler concentration; (4) to minimize wet steam, foaming and priming; (5) to detect and measure condensor leakage.

A method of securing test water samples cooled to room temperature under pressure is now offered by Bailey Meter Co., Cleveland, Ohio, in the Dieform test water cooling coil.

These coils, which consist of a tube within a tube, as shown in Fig. 1, are made from copper tubing and Dieform compression fittings. It is said in operation the hot test sample enters the smaller inner tube at the top while the cooling water enters the outer tube at the side outlet on the bottom. Cooling water completely surrounds the inner tube as it passes upward through the annular space between the tubes to the side outlet at the top.

The manufacturer says Dieform test water cooling coils are being used to secure boiler water samples, steam manifold samples, evaporator samples, turbine samples and water samples at boiler feed pumps, feed water storage tanks and purifiers.

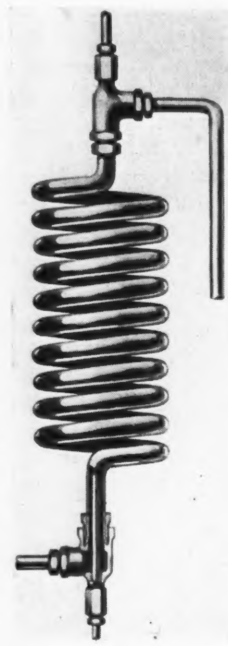


Fig. 1. Coil construction

The method of installing a Dieform test water cooling coil for obtaining boiler water samples is shown in Fig. 2. The inner tube of the coil is connected to the boiler water column blowdown so that samples of test water may be taken from the blow-down line and cooled to room temperature before they are released to atmospheric pressure. Samples taken in this manner may be collected in glass bottles at the test water outlet. A valve in the cooling water supply line makes it possible to vary the flow of cooling water through the coil and thereby control the temperature of the test water sample. The rate of flow of test water is controlled by a forged steel valve in the ½-in. steel tubing which connects the test water cooling coil to the water column blowdown.

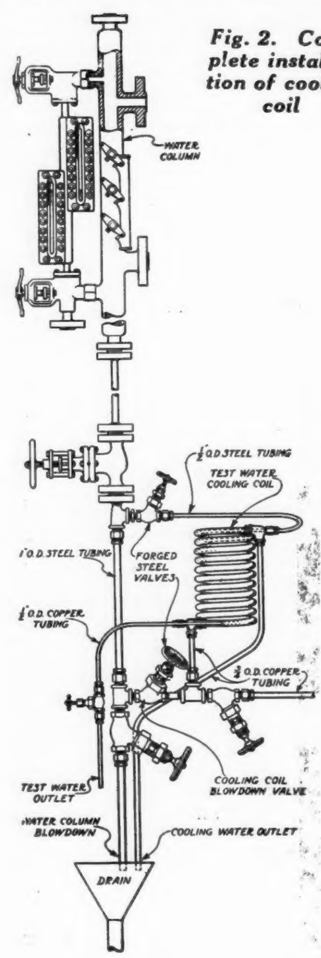


Fig. 2. Complete installation of cooling coil

According to the manufacturer, Dieform test water cooling coils are designed for working pressures up to 1500 lb. per sq. in. and may be built specially for higher pressures if desired.

Announces New Type Dust Collector

A MECHANICAL dust collector is announced by Western Precipitation Co., Los Angeles, Calif. This new collector was designed for application where the Cottrell process cannot be applied because of combustible mixtures or the small size of installations. It is said to be applicable wherever finely divided materials are to be collected from air or gas, however.

This "Multiclone" dust collector is of the centrifugal type and employes small centrifugal units in parallel. The manufacturer states that cyclone collection of dust has previously been limited to dusts in which the particles were comparatively large. It is said this new collector catches a high percentage of dusts containing smaller particles. The minimum size it will retain depends on the specific gravity as well as the size and shape of the particle.

Advantages of this new collector are said to be: Minimum turbulence disturbance factor, low maintenance and operating costs, minimum floor space required, and ease of cleaning because of sectional construction.

Dust Collector for Calcined Gypsum Dusts

A DUST COLLECTOR for calcined gypsum and similar dusts is produced by the Franklin Engineering Co., Los Angeles, Calif.

This device consists of a high speed fan of special design, into which water is introduced. It is said the temperature of the water and contact with the fan wheel tends to atomize and steam the water. This constant cool water condenses the steam, coming from the kettle in intimate contact with particles of gypsum dust, and the dust is entrained in the water to be led to a sump. The manufacturer says that the condensation of the steam from the kettle is even more effective than the washer effect which is also present.

When the dust is entrained in the water

the operation is complete. But the water must be disposed of before it sets. The air, steam and dust laden water, as discharged tangentially into an open top cyclone collector effect, the steam and air being vented at the top and dust laden water at the bottom. It is said the speed of the fan keeps the fan and collector reasonably clean.

The discharge from the collector, the manufacturer states, amounts to about 5 gal. of water per min. The normal fan load is 3- to 4-hp. but momentary overloads make a 7½-hp. fan motor desirable.

New Type Trailer

AN INNOVATION in bulk material delivery units has been introduced by the Fager Six Wheel Attachment Co., of Los Angeles, Calif., and Chicago, Ill.

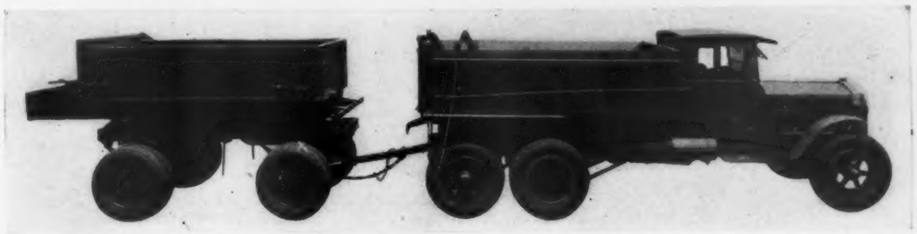
This unit was developed primarily for relatively long hauls of material, where it is necessary to leave the highway and negotiate rough or uneven and soft ground to reach the point of dumping.

The unit comprises any standard motor truck chassis with standard dump body and hoist, and a trailer with sliding body which telescopes or slides into the truck body for dumping. Two guides or "dogs" for guiding the carrier wheels of the trailer body are affixed to the rear of the truck body.

The accompanying illustrations show the five positions in changing and returning the trailer body.

In dumping, the motor truck first is unhitched from the trailer and dumped in the normal way. It is then backed up to the trailer and the trailer body unlocked from its chassis, as illustrated. The truck with the trailer body and load is then taken to point of delivery and dumping is accomplished in the usual manner.

The locks which hold the body to the truck chassis, one on each side, are similar in operation to chain locks used on log trucks or cars, and are simple.



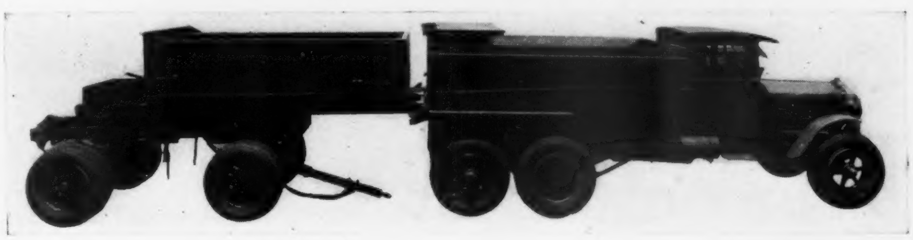
Standard truck with new type trailer

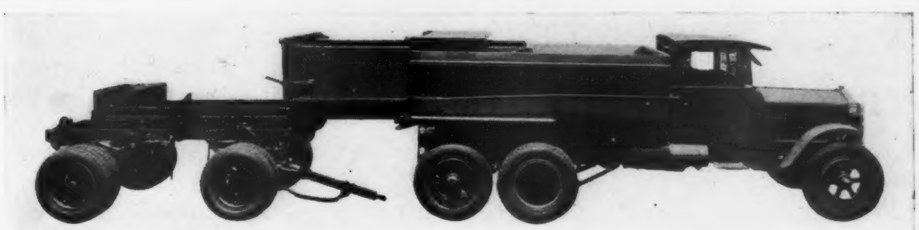
Small catches on the truck attach themselves to the trailer body and the truck is driven forward about 4 ft., where an automatic catch stops the trailer's body movement. The truck is again backed, allowing the trailer body wheels to run in a small track on the truck body floor. A forward movement of the truck pulls the trailer body forward an additional 3 ft. Then the truck is backed again, permitting the trailer body to slide completely in the truck body, being locked in place by spring catch and dogs on each side of the trailer and truck body, well forward. Mechanical provision has been made to facilitate aligning the truck and trailer for the change of bodies.

The trailer body is returned to the trailer by placing the truck flush against the trailer and raising the truck body hoist slightly. A release of the retaining locks and gravity will return the trailer body to its position.

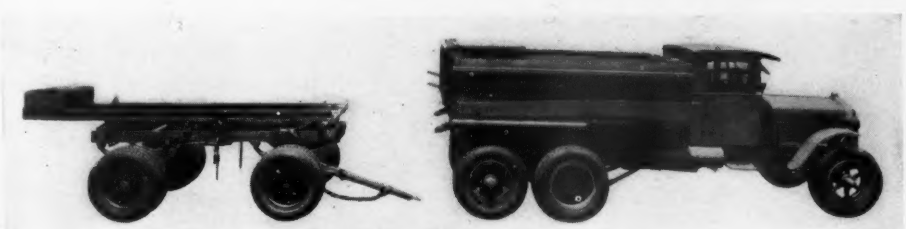
For ease of operation the trailer body rollers ride on a rail which in turn rides forward on rollers which are between it and the trailer chassis proper. This gives a roller bearing action. All rollers and bearings are of standard make and lubricated through Alemite fittings.

The trailer is built in four or six wheel models, all equipped with large brakes, either air, vacuum or mechanically operated from the truck cab.



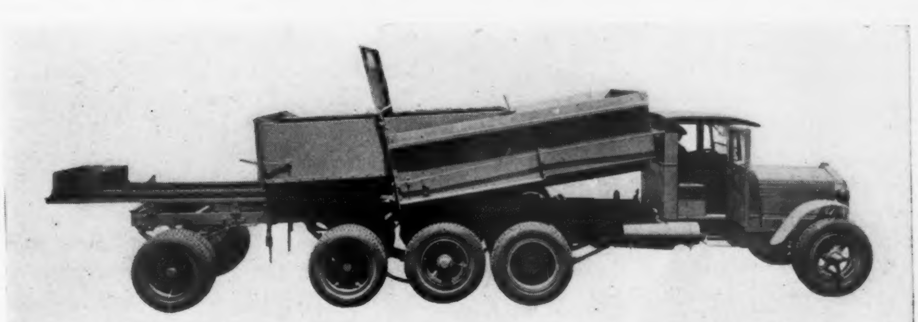


Above — First position in moving loaded trailer body to empty truck. At right— Second position in making body shift



At left—Trailer body may now be dumped in regular manner. Below — Trailer body is returned by dumping truck in regular manner

The body is of electrically welded construction and has a maximum gross weight in keeping with state specifications.



New Kiln at Indian Cement Plant

A NEW ROTARY CEMENT KILN was put in production in November, 1930, at the works of the Katni Cement and Industrial Co., Ltd., Katni, India. The kiln was made by Vickers-Armstrongs, Ltd., of Barrow-in-Furness, England, and was supplied complete with coal firing and induced draught fans and other auxiliaries. In the circuit between the induced draught fan and chimney a Davidson flue dust collector was fitted.

The kiln was fitted with Vickers' recuperator, which consists of 12 cylinders placed around the kiln shell proper and rotating with it. The use of this device eliminates the need of a separate clinker cooler, and enables the drive to be done by one motor and one set of gearing, etc. The integral type cooler as described provides considerable advantages from a thermal point of view by reducing radiation and losses due to inleaking of air.

The work of erection was carried out by the staff of the Katni Cement Co., under the supervision of an engineer sent from England by Vickers-Armstrongs, Ltd.

Clinker output and fuel consumption were guaranteed under penalty by the makers and all tests were passed satisfactorily.

The dimensions and particulars relating to the above machine are:

Length of kiln (overall)	234 ft. 6 in.
Length of kiln	220 ft. 0 in.
Length of recuperator	14 ft. 6 in.
Diameter of firing zone inside shell	9 ft. 6 in.
Diameter of kiln body inside shell	7 ft. 9 in.
Output—tons* per hour	6.15
Fuel consumption (standard dry coal)	25%
Average exit gas temperature	285 deg. C.
Slurry moisture	36%

—*Indian Concrete Journal.*

*English ton of 2240 lb.

Engineers See Movies of Cement Manufacture and Use

AN INTERESTED ASSEMBLY gathered at the Engineers' Club, Chicago, June 9, for lunch and to see "From Mountain to Cement Sack" and "Construction that Endures," two reels of movies depicting the manufacture and use of portland cement.

These reels have just been completed by the United States Bureau of Mines with the co-operation of the Universal Atlas Cement Co., Chicago. Quarry operations and the several operations in manufacture by the dry process are shown in the first reel. Numerous applications of concrete, together with the first concrete street, an early concrete structure and a concrete railroad bed were among other things seen in the second reel. These films are planned for the layman and are of an educational character, with some fun mixed in.

Consider Grand Haven, Mich., as Cement Distribution Point

GRAND HAVEN, Mich., harbor tonnage is expected to get an additional boost within a few weeks. A steamship line is negotiating to operate freight boats to haul cement from a plant in Bay City to Grand Haven as a central distributing point for western Michigan. N. Robbins has altered one of the water front buildings to be suitable for cement storage purposes.

Mr. Robbins stated that the steamer to be used on the run is of about 11,000 bbl. capacity and the type of the steamer *Sandmaster,* a freighter type built during the World war for ocean trade and later brought to the Great Lakes. Mr. Robbins would not divulge the name of the company with whom he is negotiating as he states the contract has not yet been signed. *Muskegon* (Mich.) *Chronicle.*

Michigan State Cement Plant Sale Authorized

THE STATE OF MICHIGAN is through with private business as a cement manufacturer, and the Chelsea plant, the so-called "white elephant," which has piled up a deficit of more than $600,000 in the last eight years, is to be closed. Governor Wilber M. Brucker, June 7, signed the Look bill, directing the state administrative board to sell the plant, which has been a cause of bitter controversy in several state-wide political campaigns, by 1934.

No price is set in the bill, and in legislative discussions of the state deficit and the Chelsea plant's contribution to it, the question has been raised as to whether a purchaser can be found for other than the land.

The property was acquired by the state early in the Groesbeck administration, when the state road building program was beginning to attain large proportions and private cement manufacturers were alleged to have combined to force the state to buy cement at excessive prices.—*Detroit* (Mich.) *Free Press.*

Charles E. Shearer Appointed Assistant Sales Manager

THE Keystone Portland Cement Co., Philadelphia, Penn., announces the appointment of Charles E. Shearer, assistant sales manager, effective June 1.

Mr. Shearer was with the Atlas Portland Cement Co. for a number of years in Philadelphia and Chicago, and following the sale of the Atlas company to the United States Steel Corp. he became associated with the Pennsylvania-Dixie Cement Corp.

Among other duties, Mr. Shearer will concentrate on the promotion and sale of "Velroca" high-early-strength portland cement, Keystone's new product.

Soviet Dumping of Cement Alarms Turkish Producers

THE MERCHANTS, editors, members of the Chamber of Commerce and Soviet representatives in Istanbul, Turkey, are carrying on a feud that seems to branch out more and more. Is there Russian dumping in Turkey or is there not?

There are five cement mills in Turkey and two of these were forced to close in the last few weeks. Immediately fingers were shaken toward the Black sea and there were loud cries of "Russian dumping." And yet there are some prominent editors and officials who claim that the factories closed their doors due to an understanding between dealers.

It was charged that the cement merchants had formed a trust and decided that three plants were enough for Turkey. Yet Russian cement is sold 15 c. cheaper than the Turkish in spite of the high protective duty, so that there is laughter at the idea of a Turkish trust and assertions that this is a clear case of dumping.—*Newark* (N. J.) *News.*

Award Damages in Cement Dust Case

A VERDICT of $17,500 was returned May 26 by a jury in circuit court in favor of Carl P. Smith, truck grower, in his $100,000 damage suit against the Volunteer Portland Cement Co., Knoxville, Tenn. Mr. Smith charged that dust from the company's plant injured his crops and greenhouses on his farm.

Another $100,000 suit brought against the company by A. M. Ault, truck grower, has been continued until October.

Mr. Smith alleged in his suit that he had been operating his farm and greenhouse for a number of years before the cement plant was established. Afterward the dust from the plant settled on his crops, he said, and on the glass in his greenhouses, forming a hard crust that cut off the light from his greenhouses and damaged his crops.

The expense of removing his greenhouses to a new location would be more than construction of new greenhouses, he alleged.—*Knoxville* (Tenn.) *Journal.*

A motion for a new trial has since been made by the Volunteer company.

No New Ohio Cement Plant

W. H. KILCAWLEY, secretary of the Standard Slag Co., Youngstown, Ohio, states that local newspaper reports to the effect that his company has leased property near Greenfield, Ohio, for the purpose of building a cement plant, are without foundation. Such an item, taken from the *Greenfield Times,* was published in ROCK PRODUCTS, June 6, p. 77.

Superior Cement Leases Pacific Coast Plant

THE Pacific Coast Co., Seattle, Wash., has leased to the Superior Portland Cement Co., Seattle, the plants and quarry properties of the Pacific Coast Cement Co., with a capacity of about 1,100,000 bbl. annually. The Superior company will operate the plant as a part of its general cement operations. Superior has a mill capacity of 1,700,000 bbl. annually. It is proposed to continue the Pacific Coast company's brand. The Pacific Coast plant at Seattle, which, with properties, is valued at about $3,500,000, began operations in March, 1929, and is one of four competitive cement operations in the territory. Its main quarry property is located at Dall Island in southeastern Alaska. The Pacific Coast Co., holding concern for the property from which the lease is taken, is now facing reorganization under bond default.

The arrangement, which was negotiated for Superior through Tucker, Hunter Dulin & Co. and White Weld & Co., has been in the hands of A. G. Croll, consulting engineer and former vice-president and general manager of the Atlas Portland Cement Co., New York City.

According to the *San Francisco Chronicle*, the lease is to run for five years, with privilege of renewal for an additional five years.

It has further been agreed that 40% of the net operating earnings resulting from the combined operations of the two plants will be paid as rental for the Pacific Coast Cement Co.'s plant.

Wisconsin Gravel Rate Appeal Dismissed

AT A SESSION of the state railroad commission in Madison, Wis., June 2, a petition by the Kenosha Sand and Gravel Co. for a reconsideration of the commission's order of February 10, 1931, by which rates on sand and gravel from Silver Lake to Kenosha, were reduced from 56 to 51 c. per net ton, was dismissed.

At the same time the company was granted a rehearing on the question of reparations from the North Western railroad. —*Kenosha* (Wis.) *News.*

"Crushing and Grinding"—A New Publication

TO GIVE INFORMATION about the mechanical reduction of materials by crushing, grinding, or pulverizing, and the auxiliary machinery for conveying, drying, screening, mixing, classifying, etc., is the object of *Crushing and Grinding*, an English monthly publication, the first issue of which appeared June, 1931. Collodial grinding will be included in the scope of this magazine, together with the grinding of ores and metals.

Recent Contract Prices and Prices Bid

FOLLOWING are some results of recent contracts let for public work and prices bid on rock products:

Ames, Ia.—For graveling highways:

Benton, P-471. 1.31 miles to DeWees & Whitney, Springville, Ia. $995.00. Class A crushed stone on road.

Benton, F-263. 9.16 miles to DeWees & Whitney, Springville, Ia. $7,557.00. Class A crushed stone on road.

Jackson, F-144. 10 miles to McDougall Construction Co., Sioux City, Ia. Class A gravel on road, $6,295.00.

Jackson, P-532. 27.449 miles to H. N. McCoy, Waterloo, Ia. Class A gravel on road. $17,705.25.

Jackson, P-533. 8.4 miles to McDougall Construction Co., Sioux City, Ia. Class A gravel on road. $5,287.80.

Marion, F-7. 1.9 miles to Sargent Bros., Des Moines, Ia. Class A gravel on road. $2,877.00.

O'Brien, P-604. 2.232 miles to Evans Construction Co. of Early, Ia. $955.00.

Winneshiek, P-566. 10.822 miles to M. O. Weaver, Iowa Falls, Ia. Class A crushed stone on road. $17,506.46.

* * * * *

Naugatuck, Conn.—Bids submitted for sand, gravel and stone were as follows: Mariano Trucking Co., sand for streets, $1.15 per cu. yd.; sand for cement, $1.35 per cu. yd., and gravel $1.75 per cu. yd. All of these prices included delivering either by dumping in one place or by "spotting" the materials at specified places on the roadside.

Wilson F. Clark: Washed and screened sand, $1.60 per cu. yd.; washed and screened gravel, $1.95 per cu. yd.; unwashed sand, $1.25 per cu. yd. Terms: 10 c. per yard discounted for payment in 30 days and 2% off the bill for payment in 10 days.

D. E. Carroll: coarse, screened sand, $1.10 per cu. yd.; stone, all sizes delivered, $1.80 per cu. yd.; all sizes of stone, $1.40 per cu. yd. at plant; coarse and screened sand at plant 80 c. per cu. yd.—*Naugatuck* (Conn.) *News.*

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Palmyra, Mo.—The county court has contracted with the J. W. Menefee Construction Co., of Sedalia, Mo., for the crushing, screening, hauling and dumping of gravel on the new county road project on Bay Island. The contract calls for a price of $1.10 per cu. yd. The court felt that this was a very reasonable contract as some of the material has to be hauled for a distance of 7 miles.—*Palmyra* (Mo.) *Spectator.*

* * * * *

St. Paul, Minn.—A saving of $350,000 was realized by the state in new contracts for cement for building highways. The state was given the advantage of reduced prices. The basic price at Mason City, Ia., which was $1.10 per bbl. earlier in the year was reduced to 90 c. per bbl. The state will use 1,750,000 bbl. this year, it was estimated by Charles M. Babcock, state highway commissioner.—*Mankato* (Minn.) *Free Press.*

Phoenix, Ariz.—A summary of 41 bids on five road contracts for subgrade stabilizer in quantities of 10,000- to 15,000-cu. yd. is as follows, high, 96c.; low, 35c.; average, 60c. The bids per yd. mile for hauls of from 2- to 4-miles were: high, 22c.; low, 10c., and average, 15c.

* * * * *

Jasper, Ind.—Contract for furnishing stone for roads in Dubois county for the year was awarded by the county commissioners to the Louisville Cement Co. That company bid 55 c. per cu. yd. f.o.b. Marengo. The other bidder was the Globe Construction Co. of Evansville, which bid 59 c.—*Evansville* (Ind.) *Courier.*

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Lincoln, Neb.—Contracts let for graveling highway east of Elmcreek, 2087.5 cu. yd., Diamond Engineering Co., of Grand Island, at 91½ c. per cu. yd.

For graveliing highway south of Elmcreek, 1942 cu. yd., Paul Sawyer, of Holdrege, at 70 c. per cu. yd.—*Lincoln* (Neb.) *Star.*

* * * * *

Memphis, Tenn.—The Marquette Cement Manufacturing Co., of Chicago, was low among eight bidders for furnishing 240,000 bbl. of cement for use in concrete revetment operations in the Memphis U. S. Engineer District. The John A. Denie's Sons Co., Memphis representative of the cement company, is the actual bidder. The Marquette company offered to furnish cement f.o.b. government barges, or freight cars at Cape Girardeau, Mo., for $1.30 per bbl. A bid of $1.30 per bbl. f.o.b. freight cars at Nashville was entered by Hermitage Portland Cement Co. of Nashville. The highest bid was $2.53 per bbl. for cement f.o.b. freight cars at Memphis from the Lone Star Cement Co. of Alabama, Birmingham. This bid was for cement of high strength. Delivery is to be made at the rate of approximately 25,000 bbl. per week.

Relative Price Cuts at Cleveland, Ohio

PRICES of the 42 leading commodities purchased by the city of Cleveland, Ohio, have dropped an average of 17.73% during the past year, Purchasing Commissioner A. G. Hopcraft has reported.

In the report, made to Finance Director Stephen G. Rusk, Mr. Hopcraft cites savings from 3.36% on stone up to 37.93% on potatoes. Only one commodity shows an increase in price during the first quarter of this year compared to the first quarter of last year. This is hay, with an increase of 11.79%.

Cement has dropped 25%, butter 26.6%, eggs 30.1%, pneumatic tires 16.4%, gasoline 17%, plumbing supplies 32%, dairy rations 23.75%, oats 23%, bedspreads 28.88% and other items accordingly, Mr. Hopcraft reported.—*Cleveland* (Ohio) *Press.*

News of All the Industry

Incorporations

Briar Hill Stone Co., an Ohio corporation, filed notice of withdrawal from Indiana.

Mixed-Rite Concrete Corp., Schenectady, N. Y., 1200 shares common. E. E. Weber, Schenectady.

Canadian Plaster Products, Ltd., 436 Fifth Ave. West, Vancouver, B. C., $10,000.

Sugar Creek Stone Co., Charlotte, N. C., $50,000. D. C. Dunn, 612 Grandin Road, Charlotte.

Land and Phosphate Co., Newberry, Fla. J. E. Wideman, 245 Valencia Rd., Newberry.

Superior Plastering Co., Providence, R. I., 100 shares common of no par value.

Waterbury Crushed Stone Co., Waterbury, Conn., $200,000. Daniel T. Allen, president, and Maurice T. Healey, Jr., secretary and treasurer.

Capitol Painting and Cement Co., Inc., 3225 Fillmore St., Chicago, Ill., $20,000. I. Rubin, Gertrude Perlin and Irving Mantel.

Ontario Cement Co., Ltd., Owen Sound, Ont., Can., 55,000 shares of no par value. To produce and deal in limestone, gypsum, clay, etc.

White Shell Corp., Jacksonville, Fla. A. Zetrouer, 1535 Main St., Jacksonville. To produce rock, shell, etc.

Bluff City Sand and Gravel Co., Raleigh, Tenn., 3000 shares of no par value. W. H. Herbert, W. W. Sullivan and J. D. Williams.

Eddystone Cement Corp., Manhattan, New York City, increased capital stock from 1000 to 2000 shares of no par value.

Quarries

Helmick Quarry and Crusher Co., Helmick, Kan., is making plans to reopen.

Alois Krause of Buffalo City, Wis., recently sold his quarry in Rose Valley to the county. The rock will be used on highways.

Marble Cliff Quarries Co., Columbus, Ohio, has moved its offices to the Columbian building in East Gay St.

Allentown, Penn. Operation of a slate quarry near Edgemont is starting. There are rumors that other quarries in this district will open soon.

France Stone Co. representatives will confer with Bellevue, Ohio, city officials on reducing the size of blasting charges being used at its quarries there.

Huntsville, Mo. If it is decided by the State Highway Commission to use crushed stone on route 20, local quarries will probably be opened.

George M. Brewster and Son, Inc., of Bogota, has purchased the quarries of the Belmont Stone Co. at North Bergen, N. J.

Fort Bragg, Calif. The quarry at Laughlin, near here, has resumed operations and is producing agricultural limestone.

Bilhorn, Bowers and Peters, St. Louis, Mo., plan to open a quarry near Sioux City, Ia., from which to get stone for the construction of dikes in the Missouri river during the summer.

Ohio Crushed Stone Association held its monthly meeting in Akron, June 11. Crushed stone runways at the local airport and two crushed stone streets were inspected.

Miller and Smith will operate the stone quarry on the J. E. Verly estate near Fifteen Mile Grove, Ia. This was formerly operated as the Franz-Miller quarry.

Consolidated Rock Products Co., Los Angeles, Calif., is making improvements at its Claremont plant to cost about $5000. A new crusher and dump are being installed.

Duck Creek Stone Co., Green Bay, Wis., recently obtained some favorable publicity on its operations and products in a news story in the local paper. This is an excellent way to remind local citizens of services and products of local interest.

Declezville Stone Co., Ltd., is the name of the subsidiary of Merritt-Chapman and Scott Corp., which has taken over the Vezu Bros. lease on granite quarries of Declezville, Riverside county, Calif. Stone will be sold to other contractors, as well as being used in construction work of the new lessors.

Thunder Bay Quarries Co., Alpena, Mich., plans to dredge a turning basin 600 ft. in diameter at the mouth of the Quarries company harbor to permit incoming stone boats to turn around before docking with cargoes. Construction is said to be proceeding at a satisfactory rate and it is anticipated operations may start as planned by August 1.

Sand and Gravel

Waterloo, Ia. Black Hawk county has leased a gravel pit near Hudson.

Allegan, Mich. The city council has purchased a gravel pit.

Pillman Sand and Gravel Co., Evansville, Ind., is defendant in a suit for receivership.

Bode Gravel Co., San Francisco, Calif., is planning construction of a $7000 unit at 235 Alabama St.

Pioneer Sand and Gravel Co., Seattle, Wash., will build a steel conveyor at its plant to cost $9000.

Hudson River Sand and Gravel Corp. has completed its new plant at Annsville, near Peekskill, N. Y., and it is in operation.

Missouri Gravel Co., La Grange, Mo., is building another pumping unit and making other improvements at its plant.

Ironton Gravel Co., Ironton, Ohio, is to be offered for sale at public auction June 20 by Hon. M. A. Crawford, referee in bankruptcy for Lawrence and Scioto counties.

A. R. Gray, Eugene, Ore., has purchased the interest of Kenneth Chase in the Intercity Sand and Gravel Co., of Eugene. Mr. Gray will retain his present business but will devote considerable time to his new interest, it is said.

Knoxville, Tenn. No proof of collusion was established by C. B. Alexander, sales manager of the Oliver King Sand and Gravel Co., Knoxville, Tenn., in his charge against the city manager and a trucking contractor.

Kenneth Poorman Co., Inc., is the name of a new Portland, Ore., firm organized for the operation of a general sand and gravel business. The new firm has leased the building at 351 Oak street for offices and warehouse space. Its trade will be supplied with washed Columbia river sand and Willamette river gravel by truck, rail and barge.

Cement

Lehigh Portland Cement Co., Allentown, Penn., has resumed operation at its New Castle, Penn., plant. New equipment has been installed.

Northwestern Portland Cement Co., Wash., announces opening of its new offices in the Northern Life Tower, Seattle, Wash., June 1.

Gypsum

Grand Rapids Plaster Co., Grand Rapids, Mich., is installing four storage silos with a capacity of 5000 tons of crushed rock at its plant.

Gypsum, Lime and Alabastine, Ltd., Canada, is installing four storage silos with a capacity of demonstrated the fire-resistance of frame construction built of wood studs, gypsum sheathing and wallboard interior, and insulex fill between the studs, to delegates at the British Columbia Fire Chiefs' Association in Vancouver, B. C., recently.

Lime

Eureka Lime Works, near Erin, Tenn., resumed operations recently. Wood-burned lime is manufactured.

Big Stone and Material Co., Little Rock, Ark., celebrated the opening of its new lime putty plant May 27. A special exhibit of materials and demonstration of their application was presented.

Cement Products

Penn Marblite Co. is opening a branch plant in Williamsport, Penn., and will manufacture concrete products.

Empire State Concrete Pipe Corp., Jamaica, L. I., New York, David W. Newberger, president, has leased plant and property for the manufacture of concrete pipe. It is said $50,000 will be spent in remodeling the property.

Miscellaneous Rock Products

Loving, N. Mex. A refinery for potash is to be located near here.

Calcite Products Co. has discovered calcite deposits south of Hunters Hot Springs, Mont. Mining leases have been applied for.

Enterprise Lime and Ballast Co., Norristown, Penn., has been sold to Stanley Plachecki and Thomas McHugh. Extensive improvements are planned.

Jess McKinney and Sons, Spruce Pine, N. C., have taken over the operation of the Hardin mica mines. It is reported all the mica mines in that county will be operated by these men.

Personals

Dr. J. V. N. Dorr recently inspected the phosphate plant installation his company is making for the Consolidated Mining and Smelting Co. of Canada, Ltd., at Warfield, Canada.

Stanley Owens, safety engineer, Portland Cement Association, addressed the third annual Ohio Valley Safety Conference on "Hidden Causes Revealed Through the Investigation of Accidents," at its meeting in Louisville, Ky., recently.

C. E. Skinner, assistant director of engineering of the Westinghouse Electric and Manufacturing Co., has been appointed as the representative of the American Standards Association on the Council of the International Standards Association.

W. F. Mackenzie, formerly chief chemist of the Southwestern Portland Cement Co., Los Angeles, Calif., is now assistant to the general manager of the Pretoria Portland Cement Co., Ltd., Johannesburg, Union of South Africa.

S. H. McCrory has been appointed head of the Bureau of Agricultural Engineering, a new bureau authorized by act of the last Congress. He is a past president of the American Society of Agricultural Engineers.

Fred Swineford was honored at a farewell dinner given for him by citizens of Akron, Ohio, recently. Mr. Swineford left for Columbus, June 15, where he will make his home while serving as chief engineer of the Crushed Stone Association of Ohio.

W. S. Keith, formerly manager for the Standard Gypsum Co. in Seattle, Wash., is now associated with the Construction Specialties Co. He is also western representative of the Peerless White Lime Co. of St. Louis, Mo.

George F. Newell has been elected vice-president and general manager of the Pyrometer Service and Supply Corp., Cleveland, Ohio, a subsidiary of the Claud S. Gordon Co., Chicago. He was formerly St. Louis and Chicago representative of the Charles Englehard Co.

J. S. Tritle was recently elected vice-president and general manager at a meeting of the board of directors of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn. Mr. Tritle graduated from Yale in 1893 and has been associated with the Westinghouse company since 1904.

W. A. Bickell, manager of Coast Quarries, Ltd., Vancouver, B. C., with E. Bissett, has designed plans for the solution to navigation through the Second Narrows channel. The Cote Commission has recommended this plan to the House of Commons at Ottawa for its approval.

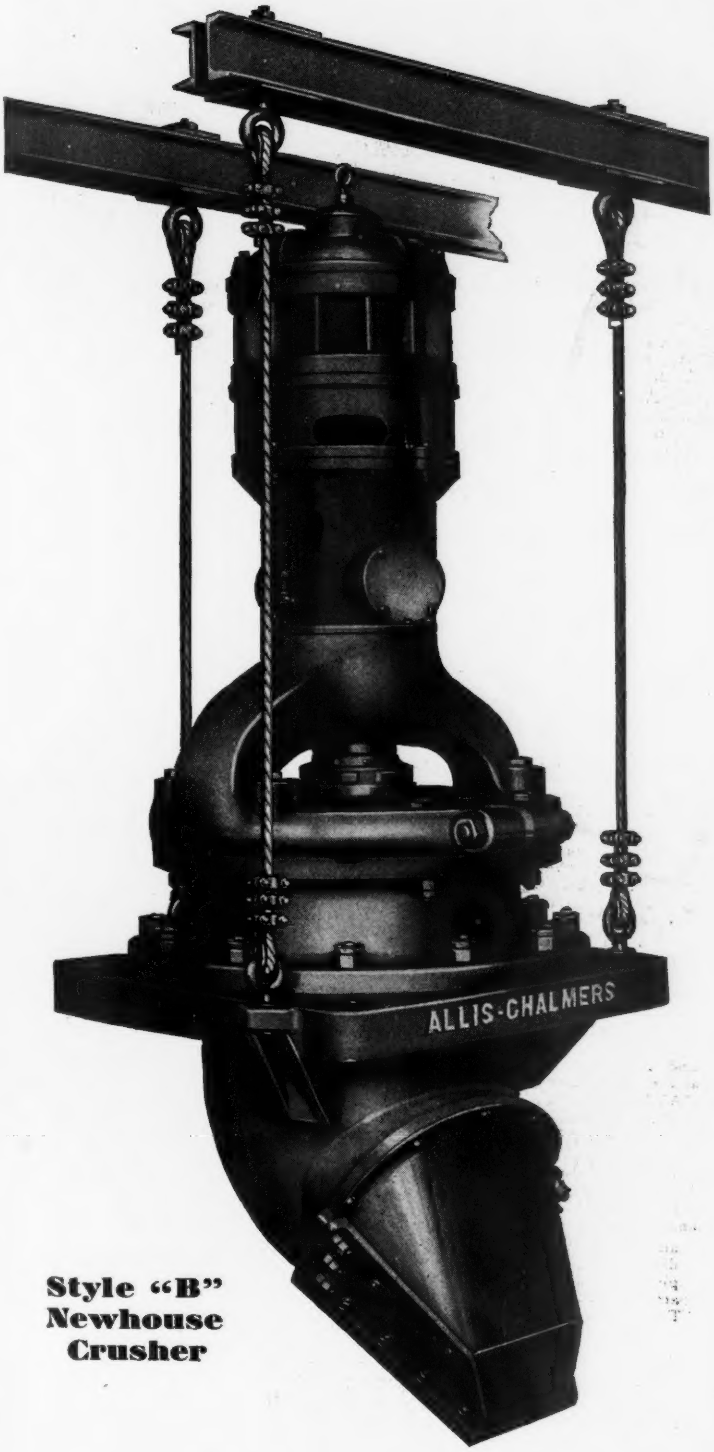
H. M. Lawrence, mining engineer, and **S. W. Benham** have been appointed to the staff of the American Standards Association. Mr. Lawrence will have supervision of all the mining, chemical, ferrous and non-ferrous metallurgy projects of the ASA and Mr. Benham will assist in the supervision of civil engineering and transport projects.

B. F. Morris, of the Pioneer Sand and Gravel Co.; **B. U. Myers**, of the Standard Gypsum Co., and **W. C. Richards**, of the Pacific Coast Cement Co., were among the trophy winners in the annual golf competition between members of the Seattle chapter of the Associated General Contractors and the Seattle Construction Council for the Superior Portland Cement Co. trophy.

D. J. Quammen has been appointed manager of the Philadelphia district office of Cutler-Hammer, Inc., Milwaukee, Wis. Mr. Quammen succeeds **F. J. Burd**, who has been made assistant manager

When you are buying Crushers

what points do you consider?



Style "B" Newhouse Crusher

First of all, you want a crusher that will yield best return on your money. That includes, not only first cost, but also maintenance and operating costs.

You want a crusher easy to feed and that will produce a maximum capacity of stone of desirable shape and screen analysis. It should be of simple construction with internal parts readily accessible, and that has been thoroughly tested under actual operating conditions.

The Newhouse Crusher is such a machine. Its short, rapid, crushing stroke gives it high capacity with a high percentage of the finished product of desired shape and size. It has a high ratio of reduction. Its direct-connected motor, cable suspension, positive oiling system, and simple and sturdy construction are other advantages. And it is built by a Company with over 50 years experience in the building of crushing machinery.

Products of Allis-Chalmers

Complete equipment for crushing, screening, and cement plants; mining and metallurigal plants;—jaw, gyratory and roll crushers; rotating and vibrating screens; multi-roll sizers; elevators, and hoists; washing equipment; motors, pumps and drives.

Write for a bulletin on Allis-Chalmers crushing plant equipment.

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

of the Chicago office of Cutler-Hammer. Mr. Burd will have charge of industrial sales in the Chicago district and of the C-H (Harland) paper machine drive, throughout the country.

Sam P. Harris, wholesale and retail building material dealer, Portland, Ore., has sold his business to A. McMillan & Co. and will devote his entire time to the wholesale business of the Standard Gypsum Co., whose distributing representative he has been for a long time. McMillan & Co. have taken the entire stock of Standard plaster and will serve the retail trade from their warehouse at East First street and Ankeny.

Obituaries

Benjamin V. White of Leesburg, Va., died at his home May 20. Mr. White was secretary-treasurer of the Leesburg Lime Co.

P. S. Rinaldo

Philip S. Rinaldo, of Wheaton, Ill., president of the Flexible Steel Lacing Co., died May 30 at the age of 54. In March, 1907, Messrs. Rinaldo, A. B. Beach and G. E. Purple founded the Flexible Steel Lacing Co. Mr. Rinaldo was secretary and treasurer of the company from its beginning, and in later years general manager. February of this year he was elected president to succeed Mr. Purple, whose death occurred on November 3, 1930.

Robert Lawless, 44, employee of the Oliver King Sand and Lime Co., Knoxville, Tenn., for a number of years, ended his life June 2.

Robert D. Gordon, president of the Gordon Crushed Stone Co., Toronto, Canada, died at his home May 28. Mr. Gordon went to Toronto from Gananoque about 20 years ago.

Richard H. Pentecost died at his home in Memphis, Tenn., May 30. In 1901 he organized the Decatur County Stone and Gravel Co. and served as general manager for many years.

C. W. McDaniel, 80, died in Ocala, Fla., in June after an illness of several months. For many years he owned and operated the Memphis Granolith Co., a cement block plant in Memphis, Tenn

Manufacturers

Osgood Co., Marion, Ohio, announces its new permanent sales and service branch located at 1038 Hoyt Ave., Ridgefield, N. J.

Ludlow-Saylor Wire Co., St. Louis, Mo., is celebrating the completion of three quarters of a century of continuous operation.

It is interesting to note that the personnel and working force of the Ludlow-Saylor Wire Co. are composed of men who have been in the employ of the company continuously from 25 to 40 years.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has purchased the assets and electrical patents of American Brown Boveri Co., Inc., and the capital stock of the Condit Electrical Manufacturing Corp.

Joseph T. Ryerson and Son, Inc., Chicago, Ill., announces it has purchased the remaining stock of the Reed-Smith Co. of Milwaukee, Wis., and the firm becomes the Reed-Smith plant of Joseph T. Ryerson and Son of Wisconsin, Inc.

Bemis Bros. Bag Co., St. Louis, Mo., announces, effective May 29, the property of the Percy Kent Bag Co., Norfolk, Va., was acquired by it. Machinery and equipment of the Ware Shoals, S. C., plant will be transferred to Norfolk at once. The new address will be 1037 West 26th St., Norfolk, Va.

Cleveland Pneumatic Tool Co., Cleveland, Ohio, manufacturers of Cleco Gruss air springs for trucks and busses and Cleco Multi-Power brakes for motor vehicles, has announced the appointment of the Pittsburgh Auto Spring Co. as distributor for the company's automotive products in Pittsburgh. J. W. Broughton, who has been distributor of these products in Pittsburgh for six years, has been named vice-president of the Pittsburgh Auto Spring Co. and will be director of sales and service for its complete line.

Hercules Motors Corp., Canton, Ohio, announces that Charles P. Weekes, vice-president in charge of eastern sales, sailed June 4 for Russia, where he will spend several weeks in the interests of his organization. During Mr. Weekes' absence A. B. Wheeling will have charge of the Hercules eastern office in New York City. The company also announces that W. W. Cromley has joined the staff of sales representatives, while Harry E. Blasingham has recently been appointed general purchasing agent in entire charge of all purchases and stores.

Trade Literature

***NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention* Rock Products.**

Diesel Engines. "Buda Diesel News" is the name of a monthly publication recently inaugurated. THE BUDA CO., Harvey, Ill.

Rail and Track Equipment. Circular and query post card on all weights and sizes of rail, track and interlocking equipment. L. B. FOSTER, Chicago, Ill.

Conveyor Screen. Bulletin **S-102** describes a new type of screen. Unique features of the screen are described. THE TRAYLOR VIBRATOR CO., Denver, Colo.

X-Ray in Industry. A bulletin, "Secrets of Metal," tells of the use of x-ray in learning about metals. Several illustrations are included. CLAUD S. GORDON CO., Chicago, Ill.

Testing Equipment. Various types of testing equipment are shown and a short description given in a new bulletin. BALDWIN-SOUTHWARK CORP., Philadelphia, Penn.

Hard-facing Products. Armite products have been developed to use in hard-facing surfaces. A brief, clear explanation of them is given in a new 12-page booklet. ARMITE LABORATORIES, Los Angeles, Calif.

Speed Reducers. Catalog 53 describes and illustrates wo.m gear, herringbone and mill type speed reducers. Detailed dimensions are given. Flexible couplings are also described. PALMER-BEE CO., Detroit, Mich.

Used Machinery. Bulletin 39 lists and illustrates motors, generators, compressors, control equipment and other miscellaneous reconditioned machinery. ROCKFORD POWER MACHINERY CO., Rockford, Ill.

Tubular Conveyor. A new folder illustrates and briefly describes the Jacoby tubular conveyor designed to handle hot, abrasive, dusty materials. A report is also given of dryer costs. HARDINGE CO., York, Penn.

Dredge and Dock Equipment. Bulletin J-7 contains many illustrations of equipment used in dredge operation. Description, dimensions and applications are presented. CLYDE IRON WORKS, Duluth, Minn.

Tractor Dump Wagon. A new bulletin has been issued illustrating the "Camel," a tractor dump wagon, at work on many different jobs. Operating advantages of the wagon are told. SHUNK MANUFACTURING CO., Bucyrus, Ohio.

Air Compressors. How 4 air compressors were compared in tests is told in a 16-page booklet, "4 Air Compressors Went to School." Specific information is included on the Davey compressor. DAVEY COMPRESSOR CO., INC., Kent, Ohio.

Roller Mills. Complete installations of roller mills and auxiliary equipment, a line drawing of a typical installation, and announcement of the new Raymond oil journal are shown and described in a 4-page bulletin. RAYMOND BROS. IMPACT PULVERIZER CO., Chicago, Ill.

Motors. Pictorial story of type T heavy-duty motors for direct current is told in **Bulletin 209.** Construction and installations are illustrated. Ratings and dimensions of the series are given in full detail. RELIANCE ELECTRIC AND ENGINEERING CO., Cleveland, Ohio.

Pumps. Pumps for handling liquids carrying solids in suspension are illustrated and described in a new bulletin. Principle of operation and description of the several parts of these pumps are included. DE LAVAL STEAM TURBINE CO., Trenton, N. J.

V-belts. A story of diversified transmission requirements and how V-belts can be applied to them is illustrated and explained in **Catalog 1002;** 62 pages of engineering data and price lists are included. L. H. GILMER CO., Philadelphia, Penn.

Ovens and Dryers. Industrial ovens for baking, drying, air tempering, vulcanizing, dehydrating, roasting and preheating are explained in a 48-page booklet. This technical subject is handled in a non-technical but explicit manner. FREAS THERMO-ELECTRIC CO., Irvington, N. J.

Car Movers. Book 1292 describes car spotters, pointing out features, and giving dimensions, capacities and detailed information. Varied applications are portrayed. A chart shows how to figure curvature of railroad tracks and pull on car mover rope. H. W. CALDWELL AND SON CO., Chicago, Ill.

Crane. Illustrated bulletin on a 1¼-yd. shovel-dragline-clamshell-lifting crane has just been issued. This booklet explains the principle of the GA-3 Gas + Air and describes the improvements made by the manufacturers in bringing out the new model. BUCYRUS-ERIE CO., South Milwaukee, Wis.

Nickel Cast Iron. April, 1931, issue of Nickel Cast Iron News contains a discussion of the properties of nickel and nickel-chromium cast iron. Charts are shown giving properties of castings containing various percentages of these materials. Methods of specifying product for particular use is also discussed. INTERNATIONAL NICKEL CO., INC., New York City.

Reducers and Gears. A complete line of continuous tooth Herringbone reducers and gears is listed in Catalog **136.** Bulletin **49** gives complete information on a series of small worm gear reducers. Many photographic illustrations are shown. Dimensions, price and horsepower ratings according to speed and ratio are given. D. O. JAMES MANUFACTURING CO., Chicago, Ill.

Shovels. New catalogs describe the "Speeder" shovels. "Whirlwind," ⅜ yd. capacity; "B-3," ½ yd. capacity and "90," 1¼ yd. capacity, are fully described. Many illustrations of these units in operation are shown. Special construction features are also pictured. Diagrams and tables give complete details of each model. SPEEDER MACHINERY CORP., Cedar Rapids, Iowa.

Measuring Instrument. Folder describing a new thermocouple for molten brass, which, it is claimed, withstands 500 to 600 30-second immersions in molten red or yellow brass at 2250 deg. F. According to the manufacturer, it gives the temperature of the hot metal deep in the crucible—not merely the surface temperature. BROWN INSTRUMENT CO., Philadelphia, Penn.

Speed Reducers. Catalog **No. 301** on **IXL** worm reducers has just been published. The first chapter describes the evolution of worm gearing with reasons for the various changes and improvements in design. The chapter, "The Customer's Problem," presents information on design, manufacturing methods, materials and selection of units, as well as data on efficiences. FOOTE BROS. GEAR AND MACHINE CO., Chicago, Ill.

Rotary Kilns, Coolers and Dryers. Bulletin **1457B** tells of applications of rotary kilns in the rock products industry. Pictures of a number of types of installations are shown. The use of coolers and dryers, construction of different units, together with some of the most important features, are fully described. A table gives kiln and dryer capacities and kiln power requirements. ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis.

Crawler Tractor. Illustrated circular describes the adaptability of the new Model GH Trackson McCormick-Deering. This heavy-duty crawler tractor is designed especially for the mounting of shovels, bulldozers, hoists, cranes, etc., and is claimed to be suited to all kinds of digging, loading and material moving operations, drawbar work and other jobs in the rock products field and around industrial plants. TRACKSON CO., Milwaukee, Wis.

Surface Condenser and Power Pumps. Specification sheet **W-200-S10** describes a surface condenser of the patented folded tube layer type. For turbo-generator with turbine-driven circulating pump, steam-air ejector as air removal apparatus, and motor driven hotwell pump. Specification sheet **D-423-E8** describes vertical triplex single-acting power pumps, giving instructions and parts list. WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J.

G-E Bulletins. GEA-1341 on totally enclosed, fan-cooled induction motors for hazardous locations—¾ to 30 hp., standard speeds, continuous duty, 55 deg. C. rise, 220, 440 and 550 volts. **GEA-831A** on manually operated field switches, Type LF-121, of the remote-control type, mounted on a separate base back of the panel and operated by a dead-front operating lever mounted on front of the panel; available in 200-, 300- and 400-ampere capacities at 250 volts, direct current, double-pole, either single- or double-throw. **GEA-1311A** on electric brazing equipment for brazing or hard-soldering brass, copper, bronze or steel in repair or production work. GENERAL ELECTRIC CO., Schenectady, N. Y.

Dead Weight Type Pressure Gage. A pressure gage which embodies dead weight tester accuracy and permanence of calibration, together with abundant power for the operation of remote type indicators, recorders and control devices, is described in a new bulletin **No. 70** entitled, "Power Type Pressure Devices." How the dead weight tester principle is combined with a hydraulic torque amplifier and a selsyn motor system of long distance transmission is explained. This power type unit may also be used for the operation of switches or for the direct positioning of small valves, rheostats or other equipment in accordance with pressure. Its principle use, however, as explained in the bulletin, is for the operation of a faster steam pressure indicating and recording system where it is desired to have a number of indicators or recorders located at various stations. BAILEY METER CO., Cleveland, O.